# SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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## GLASS ENAMELED STEEL CASKS FOR BREWERS, SUGAR REFINERS, GLUCOSE MAKERS, ETC.

The glass enameled steel casks herewith illustrated, made by the Detroit Safe Works for the Pfaudler Vacuum Fermentation Company, of Rochester, N. Y., are in many respects the finest examples of enameled steel work yet produced. They are designed for use as filters in glucose and sugar refineries, evaporating tanks for salt works and other purposes, and to replace wooden tubs and casks in breweries, and have been widely adopted by the latter in connection with the celebrated vacuum system of ageing and ripening beer. The body of the cask is composed of a series of welded steel rings ¼ in. in thickness, with right angle flanges at each edge. The heads are stamped from single sheets of steel ⅝ in. in thickness in a powerful hydraulic press, and the inside is coated with a glass enamel melted into the steel at a high heat. These sections and heads are bolted securely together with ⅝ in. bolts, two inches apart, and the flanges are reenforced by continuous steel washers ⅜ in. thick. Between the joints a very thin asbestos and plumbago packing, odorless and tasteless, is used. The height of each ring is 30 in., and the diameter 90 in. The heads are dished 10 in. and given a smooth, strong, and beautiful form in the hydraulic press. Each ring is made of a continuous sheet of the best homogeneous steel, 35 in. wide, brought into circular form, when the ends are welded together by a special process, making a continuous weld 35 in. long of ¼ in. steel. The rings are then placed in the flanging machine shown in the main view, and a flange is spun over cold at right angles 2½ inches wide. The welding and flanging of these rings are beautifully done, and are triumphs of fine work in steel.

When put together with four rings or sections, as shown in the view of the completed cask, they make a cask holding about 110 barrels, having the strength of steel outside and the purity of continuous glass inside, and are odorless, tasteless, acid-proof, and practically indestructible. They are also air-tight under both vacuum and internal pressure. They have cast iron legs made adjustable to fit the inequalities of the floor, and are fitted with convenient manhole and other openings. For the purposes designed, they are both unique and unequaled. Each section, including the heads, is enameled separately and revolves while heating in a furnace specially constructed for the purpose, by which the enamel is burned on uniformly at all points. The casks can be drilled at any point without chipping the enamel, which shows a union between the steel and enamel of extraordinary tenacity, which is not found in the case of enameled cast iron.

These casks are in use in several glucose works and many breweries. In the latter, in connection with the vacuum system of the Pfaudler Vacuum Fermentation Company, a remarkable saving has been effected in the cost of producing lager and a product of remarkable purity and keeping qualities obtained. This system was invented and perfected by Mr. Casper Pfaudler, the superintendent of the company, and has done much toward working an economic revolution in brewing methods. The process at present is adapted to the ageing or ripening stage, which is now completed in about ten days, instead of requiring from four to six months, as was indispensable under former methods, while the process is perfectly natural, no drugs, chemicals, or preservatives being used. No change is required in the methods or the plant required for brewing, and this process simply multiplies the capacity of a brewery by so much hastening the work, the beer being run direct from the fermenting tubs into airtight casks connected with double vacuum pumps through intervening reservoirs and regulators. A partial vacuum of about twenty inches is kept in the casks, by which the beer is fully aged and made ripe for the shavings casks, the vacuum being kept perfectly steady by a secondary regulator, whether the steam is high or low, and all vibrations of the beer entirely prevented. The beer thus made is said to fine quicker and better than other beer, so that it can be put on the market within twenty days from the fermenting tubs.

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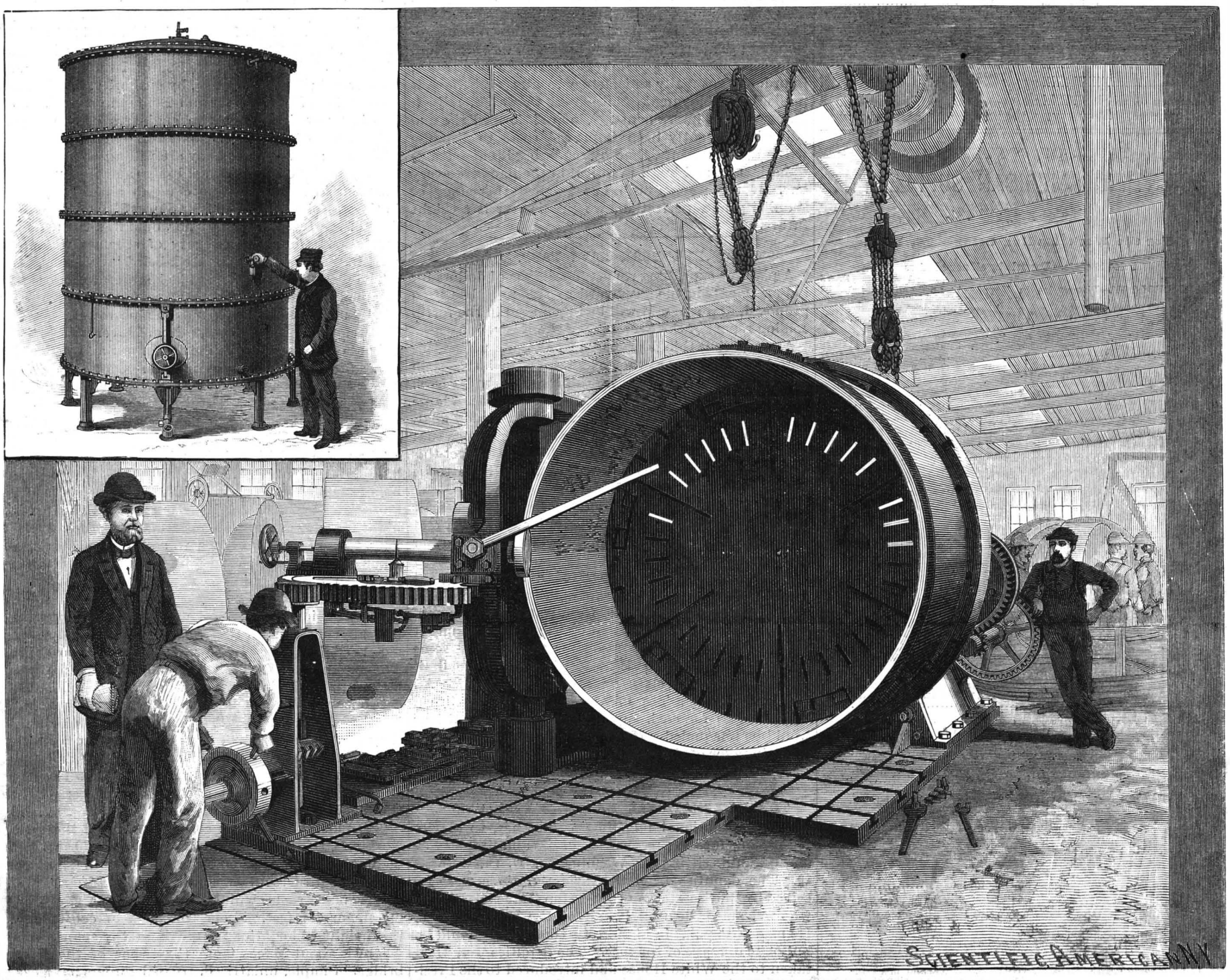
IT is something unusual to find the white of a fresh, hard-boiled chicken egg colored *red*, after taking off the shell. I presumed that I had to do with a microorganism; tried to cultivate it, and was not disappointed. A potato substrate was in short time covered with an intense growth of bacillus prodigiosus. We have here a bacillus that not only withstood being boiled for a certain time, without impairing in the least its vitality, but one *inside* of fresh eggs.—*V. L. H., Pharm. Weekblad; Drug. Bulletin.*



MANUFACTURE OF GLASS ENAMELED STEEL CASKS.

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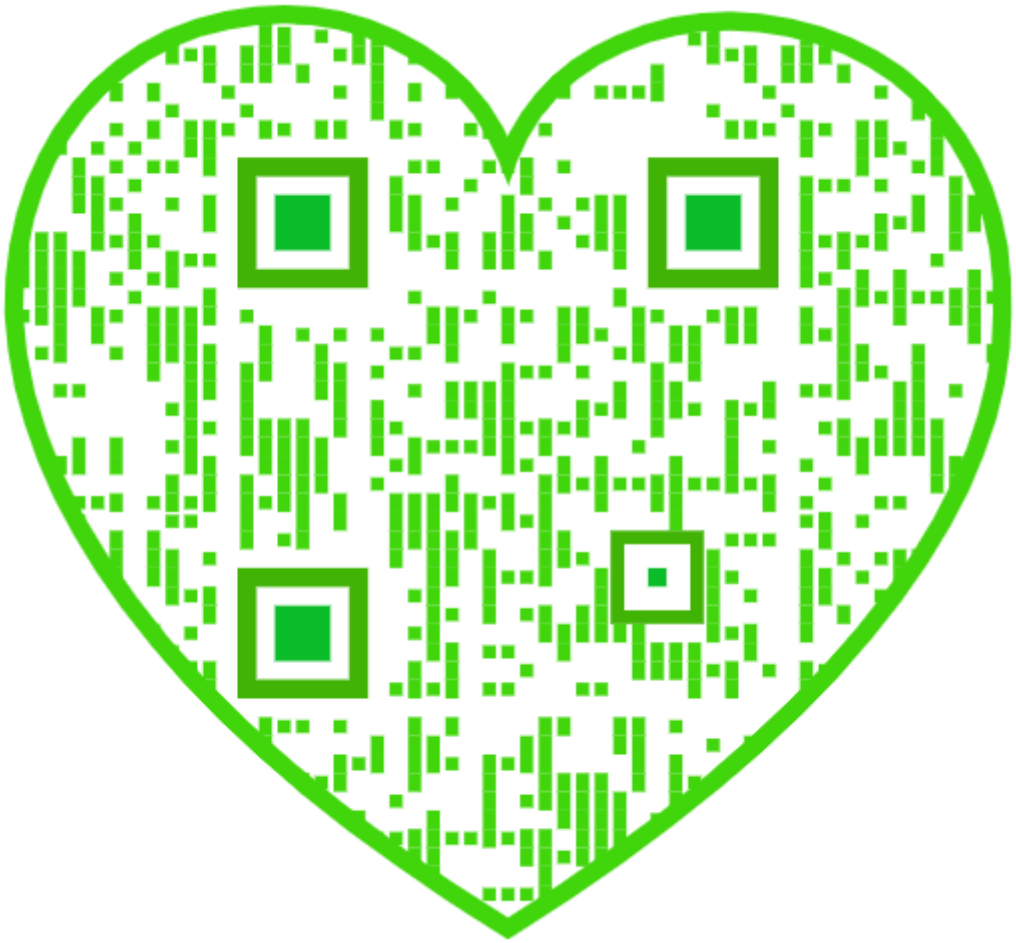

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### DEPARTURE OF THE AMERICAN ASTRONOMICAL EXPEDITION.

The United States war ship Pensacola left New York on the 17th of October for the west coast of Africa, having on board the members of the scientific corps commissioned to go to Africa to observe the total eclipse of the sun, which takes place on the 22d of December. Many valuable astronomical instruments have been provided, photographic cameras, etc.; also others for deep-sea investigations, which Professor Agassiz will conduct.

Professor David P. Todd, of Amherst College, Massachusetts, is the chief of the expedition. Although a young man, he stands high as an astronomer, and is admirably qualified for the position he has assumed. He will have among his assistants Prof. H. F. Bigelow, of Racine College, a well-known mathematician and astronomer; Prof. E. J. Loomis, of Harvard, astronomer and naturalist; Prof. C. Abbe, of the College of New York; Prof. L. H. Jacoby, of Columbia College; E. B. Preston, of the Coast Survey; W. H. Brown, of the National Museum; Prof. H. S. Davis, of Princeton University; J. H. Carbutt, photographer. (Orthochromatic dry plates will be used, and superior apparatus, by which images of the sun, four inches in diameter, will be taken.) E. J. Wright, assistant photographer; Prof. C. A. Orr, of Clark University; Prof. G. E. Van Guysling, and others.

The appointed station is Maxima, on the Guanzo River.

The total eclipse of the sun will be visible in a long, narrow path 5,000 miles long and only 100 miles wide, which extends nearly its entire distance over the ocean. It begins in the Caribbean Sea and skirts the northern coast of South America, being visible at only one point there, French Guiana. It then moves eastward until it strikes Africa, a few hundred miles south of the Congo River. An expedition from the Lick Observatory, in California, will go to French Guiana to view the eclipse there.

### THE PHONOGRAPH NOT YET READY.

In reply to numerous inquiries we can only say the new instrument has not yet been reduced to that simplicity and perfection of operation necessary for its general sale and introduction. It is true, several examples have been produced which are in use, and many interesting experiments have been made. At the Paris exhibition the instruments were shown in operation, and the perfection of the results in recording and delivering speech was marvelous. But in most cases, in order to get really satisfactory results, we believe it needs the employment of an expert to watch, adjust, and work the instruments. We are informed the machine has recently been improved so as to dispense with all adjustments, thereby rendering it entirely automatic, and making it practical in the hands of every one. If the phonograph has reached this stage of simplicity and perfection, we predict for it a bright future.

### NEW YORK NAVY YARD.

A plan for expending some ten millions of dollars for improvements in the navy yard at this port has been proposed, and it is said will be introduced in the forthcoming report of the Secretary of the Navy.

Among other things proposed to be done under this plan is to put gates at the entrances to the large basin now existing, put down artesian pipes so as to let fresh water up, pump out the salt water, and so form a large fresh water basin, wherein our gallant navy may float, safe from the barnacles and other clinging things that foul the bottoms of iron and steel ships. To effect this improvement the walls of the basin will have to be enlarged and strengthened.

It is also proposed to supply some great floats for directly bringing to the yard cars loaded with great guns, when forwarded from Washington or other points.

Other improvements consist of a new fitting-out basin, electrical motors, cranes, railway tracks, etc. So far as the formation of a fresh water basin is concerned, it seems as if the great expense involved might be avoided by having a station for the ships at some convenient place up the Hudson River above the limit of salt water—say sixty or seventy miles up. All classes of vessels might be stored there; the railroad conveniences for coal, supplies, guns, and munitions would be unequaled. Many cogent reasons might be given in favor of the removal of all the main works of the yard to the locality we have indicated.

### THE INTERNATIONAL MARITIME CONFERENCE.

The international maritime conference, to devise regulations for the preservation of life and property at sea, began its sittings at Washington, D. C., October 16. The deputies from the various nations were received by the Secretary of State, Hon. James G. Blaine, who welcomed them on behalf of the United States. He made the point in his address that there should be but one language of the seas. The deputies were then taken to the White House and introduced to the President. On the succeeding day the conference organized, established the hours of meeting and adjournment, and at once proceeded to discuss the questions before the meeting. How fully the long programme will be carried out remains to be seen. Mr. Charles Hall, on behalf of the British empire, announced that he and his colleagues felt that the deliberations, owing to limited time, should be confined to the subjects of: 1. "Marine signals or other means of plainly indicating the direction in which vessels are moving in fog, mist, falling snow, and thick weather and at night; rules for the prevention of collisions, and rules of the road." 2. "The draught to which vessels should be restricted when loaded." These form subjects Nos. 1 and 3 of the programme. The conference at once began the discussion of the "rules of the road," the arrangement of sailing lights, etc. The following countries are represented in the conference: United States, Austria-Hungary, Belgium, China, Denmark, France, Germany, Great Britain, Guatemala, Hawaii, Honduras, Italy, Japan, Mexico, Netherlands, Norway, Russia, Siam, Spain, Sweden, Venezuela. The outcome of the deliberations will be watched for, as they will affect such important interests, and will undoubtedly render travel on the great ocean lanes far safer than it has hitherto been.

### A BRIDGE FOR THE ENGLISH CHANNEL.

A bridge across the English Channel, joining France with England by rail, is now considered feasible by some of the most eminent engineers of those countries.

Such men have declared their willingness to undertake the construction, and financiers of adequate resources offered to raise the necessary funds for its completion. Such a bridge would shorten the trip from Paris to London, including the Channel crossing, to five hours, where now from nine to eleven hours are required by way of the strait of Dover, a bit of water which, as every traveler knows, has more tumble and pitch and roll in it than any similar stretch of traveled highway the world over. The project being now looked upon with favor by engineers and financiers, the question is left for Parliament to decide—one of political expediency; and as, from a practical standpoint, it brings up the same issues that were involved in the Channel tunnel project, there yet remains one obstacle at least in the way of its accomplishment.

The subject was brought to the attention of the recent meeting, at Paris, of the Iron and Steel Institute, by the reading of a paper by M. Henri Schneider, entitled, "The Channel Bridge, Preliminary Designs by Messrs. Schneider & Co. (Creusot Iron Works) and H. Hersent;" the title page, by authority, bearing the names of Sir John Fowler and Benjamin Baker. The two last mentioned are the engineers of the Forth bridge, one of the most remarkable engineering feats of the day; and the fact they are willing to guarantee the feasibility of the Channel bridge and that "a great financier in Paris, one who could do almost anything in the way of money," told Sir James Kitson, the president of the Institute, that "he would find the money," removes it from the category of schemes which, at least in public estimation, are labeled "visionary."

The plan is to construct a steel structure across the Channel from Folkestone to Cape Grisnez, a distance of 24½ miles, and though not the narrowest part of that tempestuous waterway—from Dover to Calais is only about 20 miles—it is the shallowest and hence the best suited for bridge construction. On this line the deepest water is about 30 fathoms (180 feet). A million tons of metal would be required, the total cost being estimated at $170,000,000 (£34,000,000), and the time necessary ten years.

The white and blue chalk with an underlying base of slate forming the channel bottom is, it is said, capable of sustaining a weight of about 10 tons per square foot. The piers, of solid masonry and raised above high water mark, are to be rectangles, each 82 feet long, the other dimensions to suit the substructure. Upon these will rest metal columns to carry the superstructure high enough to allow of free navigation below.

M. Schneider says: "The surface (of supporting piers) in contact with the ground may be 1,604 square meters (17,265 square feet) or less, according to depth. The masonry will be built inside metal caissons forced by compressed air down to the solid ground. The caissons will be surmounted by metal cases surrounding the masonry, and will serve to float the piers until they touch the ground. The distance between the piers is fixed at 500 and 300 meters (984 feet and 1,640 feet) for the large spans, and will not be less than 200 and 100 meters (656 feet and 328 feet) respectively for the small spans.

"The metallic columns are to be, as is all the metal work, of steel, the height varying between 40 and 42·78 meters (131 feet and 140 feet). On these will be placed the main girders of the bridge. The head room, or rather mast room, will be at high water springs 54 meters, or 177 feet. From the form of construction this height will continue throughout the spans. This height is about 26 feet more than that of the Forth bridge. Simple, unlatticed, trussed girders have been adopted in the design. The permanent way is 72

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meters (236 feet) above the low water level. There will be double sets of rails, and the width of the flooring proper will be 8 meters (26 feet 3 inches). The whole width of the bridge is variable, the greatest distance between the main girders is 25 meters (82 feet 3 inches), such a space being necessary to insure the stability of the structure against violent wind."

To build a solid pier of masonry in the boisterous and rolling seas of the English Channel would seem, indeed, almost beyond the power of man, but this plan of M. Schneider's of building the piers in still water in metal caissons and floating them out to their places obviates the difficulty. Nor is it so bold as would appear, for he points out the fact that, at Toulon, immense masses of brickwork, sometimes as much as 100,000 tons weight, have been floated for months. Indeed, he says that, if a pier when sunk is found to be out of position, it can be floated again and resunk. The spans are to be from 900 to 1,500 feet, with a central independent span, by which a saving of about 17 per cent in weight may be effected.

The plan for a tunnel under the Channel has for years been looked upon as feasible. In 1880 an English company, the Submarine Continental Railway Company, began the work of excavation near Dover, at Shakespeare's Cliff, and, at the same time, a French company, with a concession from their government, began work at Saugatte, near Calais, completing full 500 feet of tunnel and making borings for a quarter of a mile in the direction of the English coast. The English company could not get government sanction, however, the discussion of the matter in Parliament being a notable one because of the stand taken by British statesmen and soldiers, who maintained that a tunnel would lose to England her insular advantages, the fear of French control being openly expressed by Gen. Wolseley, Adjutant-General of the British army, even reckoning an invasion of the French and their sudden seizure of both ends of the tunnel as among the dangers that might result. This objection seems to apply even more forcibly to the bridge project, and there is no present prospect that Parliament will sanction the scheme.

## THE NEW TYPE OF WAR SHIP.

The protected cruiser Piemonte, built by Sir William Armstrong's company for the Italians, tried her battery lately ten miles out from the mouth of the Tyne, maneuvering meanwhile, and the record of that performance signals a new type of ship and armament, a type, be it said, which in the world's navies has nothing to equal it in aggressiveness and precision. Indeed, it may confidently be said for it that it marks an era scarcely less distinctive and radical than that which was heralded by the famous conflict between the Monitor and Merrimac in Hampton Roads.

With a battery composed wholly of quick-firing guns, the largest being of the new Elswick type, 6 in., 5 tons 15 cwt., "she threw, in a given time, twice the weight of shot and shell of any war ship afloat, not excepting the leviathan battle ships five or six times her size, which could ill withstand the torrent of shell which the Piemonte could pour into the large unarmored portions of their structures." So says Sir William Armstrong, the famous war ship builder, and the expert testimony resulting from the trial goes to sustain his assertion. The battery of the Piemonte consisted of: Six 6 inch quick-fire guns. Six 4·7 inch quick-fire guns. Ten 6 pounder Hotchkiss. Six 1 pounder. Four 10 mm. Maxim guns. Three torpedo tubes for ejecting torpedoes.

Floating targets being set and the order given, a continuous hail of projectiles was let fly at them from alow and aloft. No attempt at maximum work was made, though a picked crew from the Armstrong works was along, Admiral Cottereau and Captain Candiani wishing to try the ship's crew. Nor was this necessary, as the range, power, and possibilities of the Elswick patterns were officially determined at Portsmouth, at the proving grounds, some time since.

The 6 inch quick-firing gun, with a 100 pound projectile, fires six rounds per minute with a muzzle velocity of 2,340 foot seconds, total energy 3,797 foot tons, penetration in wrought iron 14·7 inches. The breech-loading service gun with same projectile is good for only three rounds in two minutes, with muzzle velocity of 2,000 foot seconds, total energy 2,774 foot tons, and penetration in wrought iron 12·5 inches. The 4·7 inch Elswick quick-fire gun has fired twelve rounds in 1 minute 5 seconds, eight rounds in 32 seconds, ten rounds in 53 seconds, twenty rounds in 1 minute 32 seconds, thirty rounds in 2 minutes 30 seconds. It weighs 2 tons 1 cwt., throwing a solid 45 pound shot. Hence in 17 minutes the six 6 inch and six 4·7 inch quick-firing guns of the Piemonte, when worked by a trained crew, would throw about 600 shots, each weighing 100 pounds, and about 1,200 shots, each weighing 45 pounds, or a gross weight of metal of 57 tons.

Now, it is immediately obvious that such rapid firing, if ordinary powder were used, would hide the targets and envelop the ship herself in a cloud of smoke; but, by the use of Chilworth smokeless powder, no such awkward condition prevailed at the trial for a moment. This powder, in reality, is not entirely smokeless. It throws off a slight haze, the combustion not being entirely complete, but, as was shown in the trial, this is not enough to hide an enemy; the Piemonte circling the targets so as to get the wind—it was blowing lightly—ahead, dead aft, and over the beam; even when firing to leeward, the worst condition, as smoke, if there had been any, would hang between gun and target, there was not any appreciable obscuration.

The remarkable quality about the Piemonte is that, though, under the present rating, belonging to the class of ships that are supposed to avoid battle ships, being given quick heels for that purpose, she is built to stand and fight with the best of them, even with the monsters that mount a 100 ton or 115 ton gun in each turret. No big ship could catch her, nor, indeed, any other now afloat, as will be shown later on, for she was built for "great speed and nimbleness of movement combined with great defensive power and little or no side armor, but otherwise constructed to minimize the effect of projectiles." Being able to choose her own firing point, let us suppose her as describing a series of circles about a giant adversary and letting drive at him with her battery meanwhile. What would a hundred ton gun, with its lumber and sloth, avail against a flying target? What a disadvantage the 8 in. and 6 in. breech-loading service guns would be put to. The quick-firing battery, with an advantage at the start, would increase it, because having a target at the core of the circle she was describing. As was proved in a recent gun test in England, the 6 in. quick-firing gun has the power to disable the 115 ton gun, one of the shots penetrating the barrel of the big gun and effectually plugging the bore.

The penetration of the 6 inch quick-firer, as said before, is 14·7 inches in wrought iron, while the armor of some of the largest battle ships is 23 inches. and even more. But it has weak points, many unprotected spots, because too heavy for covering any save vital parts, and these the Piemonte could, doubtless, break through. Indeed, Sir William Armstrong thinks it would be impossible to work a big ship or handle her guns effectively under such a hail of destructive shot as the Piemonte can maintain.

In point of speed the ship is scarcely less remarkable—steaming continuously in fair weather, with *natural draught*, at from 20¼ to 20½ knots an hour, and with forced draught at 22·3 knots, thus being able to overhaul the fastest merchant steamer afloat, *i. e.*, the City of Paris, whose best 24 hours' run thus far, 515 knots, averages barely 21½ knots an hour, the same being aided by sail.

The Piemonte is 300 feet long, 38 feet broad, 15 feet mean draught, 2,500 tons displacement, and having engines capable of developing 7,760 horse power normal and 11,600 with forced draught.

The Piemonte has no great turrets and towers, looking, indeed, more like a blockade runner or merchantman than an engine of war. Yet incorporated in her are the most advanced ideas in war ship designing, and to us who have been expending labor and capital in a vain attempt at modern ship building, she is worthy of careful study. The designs which Secretary Whitney paid large sums to the English for were little better than obsolete when ordered. The result has been a fleet of ships which even the officers commanding them admit to be neither strong enough to fight, nor, with one exception, fast enough to run away. The plans of one of them, the Texas, now building, are so defective that the designers, the Barrow Shipbuilding Company, have openly admitted that she will not float when built.

## POSITION OF THE PLANETS FOR NOVEMBER.

### SATURN

is morning star, and the most interesting member of the planetary brotherhood during November, for he is rapidly coming into convenient position for observation, being above the horizon at 11 o'clock P. M. at the close of the month. He is in quadrature, or 90° west of the sun, on the 25th at 11 h. A. M. Saturn rises on the 1st at 0 h. 46 m. A. M. On the 30th he rises at 11 h. P. M. His diameter on the 1st is 16″.4, and he is in the constellation Leo.

### NEPTUNE

is morning star until the 25th, and then evening star. He is in opposition with the sun on the 25th at 1 h. A. M., when he passes to the eastern side of the sun and becomes evening star. This is the most interesting epoch in his course for terrestrial observers, as he is nearest to the earth. If any interesting discoveries are ever made in regard to this far-away planet, it will doubtless be at the time of his opposition. Neptune rises on the 1st at 6 h. 8 m. P. M. On the 30th he sets at 6 h. 30 m. A. M. His diameter on the 1st is 2″.6, and he is in the constellation Taurus.

### VENUS

is morning star. She shines brilliantly in the eastern sky before sunrise, though she is shorn of her brightest rays as she approaches the sun, rising at the commencement of the month about two hours before the sun. As she moves eastward toward the sun she encounters Uranus traveling westward from the sun. The two planets are in conjunction on the 9th, at 1 h. 53 m. P. M. Venus rises on the 1st at 4 h. 19 m. A. M. On the 30th she rises at 5 h. 31 m. A. M. Her diameter on the 1st is 11″.6, and she is in the constellation Virgo.

### JUPITER

is evening star, and outshines every other star during his presence in the sky, in spite of his unfavorable position, low down in the southwest, and his great distance from the earth. He makes a charming picture on the evening of the 25th, when near the three days' old moon. Jupiter sets on the 1st at 8 h. 6 m. P. M. On the 30th he sets at 6 h. 38 m. P. M. His diameter on the 1st is 33″.2, and he is in the constellation Sagittarius.

### MERCURY

is morning star. He is in conjunction with Uranus on the 3d, for, moving toward the sun, he meets Uranus moving from the sun. Mercury rises on the 1st at 4 h. 55 m. A. M. On the 30th he rises at 6 h. 50 m. A. M. His diameter on the 1st is 6″.4, and he is in the constellation Virgo.

### MARS

is morning star. He is slowly approaching the earth, as the slight increase in his diameter, as well as the earlier time of his appearance above the horizon, make plain. Mars rises on the 1st at 2 h. 40 m. A. M. On the 30th he rises at 2 h. 13 m. A. M. His diameter on the 1st is 4″.6, and he is in the constellation Virgo.

### URANUS

is morning star, and meets Mercury and Venus as he moves westward from the sun, showing that the three planets are near neighbors during the first part of the month. Uranus rises on the 1st at 5 h. 6 m. A. M. On the 30th he rises at 3 h. 20 m. A. M. His diameter on the 1st is 3″.4, and he is in the constellation Virgo.

Uranus, Mercury, Venus, Mars, and Saturn are morning stars at the close of the month. Jupiter and Neptune are evening stars.

## Academy and Home for American Ship Builders.

Mr. William H. Webb, the veteran ship builder of this city, ranking among the most distinguished of his craft in this country, has decided to found an academy and home for ship builders. Mr. Webb has deeded one-half of his estate to the corporation established by act of Legislature for carrying out his plans. This secures it from failure, as the sum thus awarded is considered to be in the neighborhood of two millions of dollars. This insures the carrying out on the most munificent scale of the founder's intentions. Expressed by himself they are "to afford free and gratuitous aid, relief, and support to the aged, decrepit, invalid, indigent, or unfortunate men who have been engaged in building hulls of ships or vessels, or marine engines for such, or any parts of either the hulls or engines, in any section of the United States, together with the lawful wives of such persons, and also to provide and furnish to any young man, a native or citizen of the United States, who may, upon examination, prove himself competent, of good character and worthy, free and gratuitous education in the art, science, and profession of ship building and marine engine building, both theoretical and practical, together with board, lodging, and necessary implements and materials while obtaining such education."

## Water for San Francisco.

San Francisco is about to introduce better water supplies. The El Dorado Water and Deep Gravel Mining Company has presented to the city a proposition to supply the city with an abundance of pure water.

The water rights owned by the company consist of a series of magnificent lakes lying along the summit of the Sierras, embedded in almost perpetual snows.

The storage capacity of six of the principal lakes belonging to the company is as follows:

Silver Lake, 25,000,000,000 gallons; Twin Lakes, 10,000,000,000 gallons; Echo Lake, 61,000,000,000 gallons; Medley Lake, 23,000,000,000 gallons; Glacier Lake, 15,000,000,000 gallons; Andrian Lake, 6,000,000,000 gallons.

The company has 350 square miles of watershed lying above the point of diversion.

In addition to these magnificent natural reservoirs there are numerous smaller lakes, aggregating in capacity 25 per cent of that of the lakes above mentioned, capable of a water supply of 250,000,000 gallons per day.

The advantages claimed for this scheme are, first, the adequacy of supply under all conceivable conditions and contingencies, present and prospective. Second, the economy of maintenance, due to the advantages and facilities for supplying other large and growing communities in transition. Third, the important hygienic properties of the water, due to its great purity and freedom from contamination.

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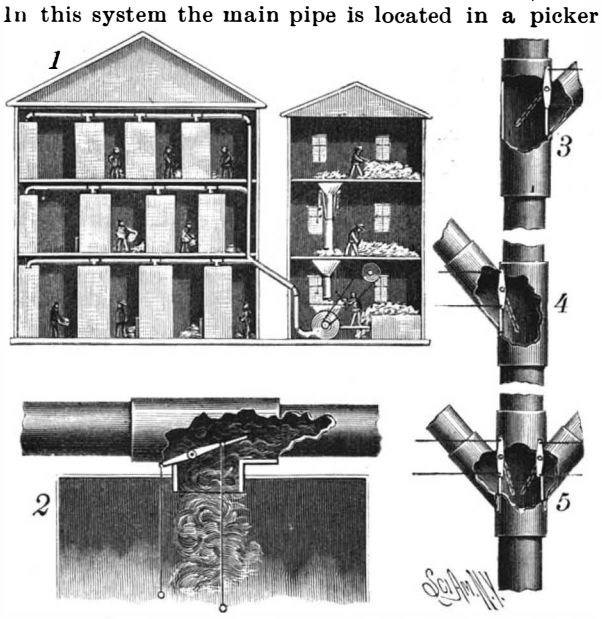
### PNEUMATIC CONVEYERS FOR USE IN MILLS.

An improved system of conveyers for use in mills and similar places, and which makes use of the pneumatic system, has recently been patented by Mr. Chas. H. Schnitzler, of 640 Federal St., Camden, N. J. In this system the main pipe is located in a picker

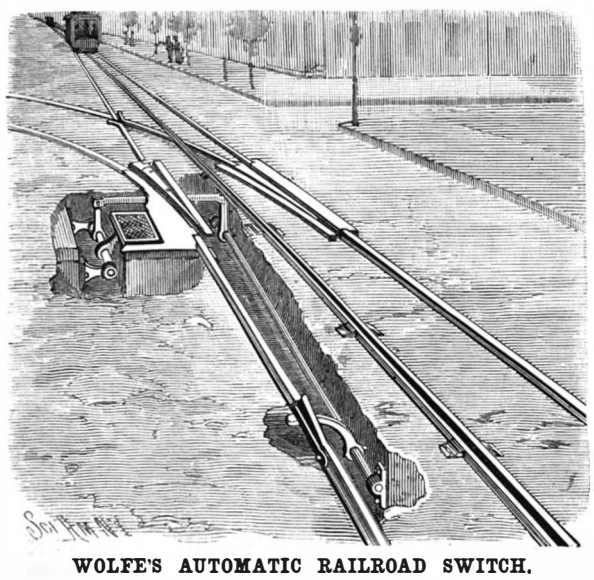



SCHNITZLER'S PNEUMATIC CONVEYERS FOR USE IN MILLS.

house and is conducted from there to an adjacent mill, where it is introduced, with its branches, to various parts of the building, the pipe and its branches terminating over certain bins or receptacles. The cotton or woolen fibers or shavings, or other light material, is first delivered into a funnel, shown at center of the engraving, and from there it is deposited into the main pipe, where it is carried, under the pressure of the wind blast, into the building adjoining. The funnel is provided with a telescopic lower section, by means of which the delivery pipe may be lowered or raised out of the way. An ordinary fan blower may be used for forcing the material through the pipes. With this arrangement of pipes, fan blower, and blower feed devices it is obvious that the same blower will take cotton, wool, or other fibers from separate rooms in the picker house occupied by different firms or tenants, and will deliver into the mill building into specific rooms and on different floors, and without danger of mixing the different materials. The cotton or other fiber is carried through the main pipe, and is deflected from there into the branch pipes by means of valves, so constructed as to close the main pipe and open the mouth of the branch pipe. Different modifications of this construction are shown in Figs. 2, 3, 4, and 5 of the drawings.

### WOLFE'S AUTOMATIC RAILROAD SWITCH.

An improved railroad switch, for use preferably on combination surface and cable roads, has been recently patented by Mr. John E. Wolfe, of 124 East 126th New York City. In the accompanying illustration the main track is represented as a cable road, while the side track is an ordinary horse car track. At the center of the main line is represented the opening to the cable. The ground is broken away so as to show the construction of the switch proper. The ordinary form of pivoted triangular switch rail is employed, as shown at the left of the cut, and connected with it pivotally is a horizontal rod that is connected by means of intermediate crank arms and shafts with the platform in such a manner that when the latter is depressed the switch is set for the side track. The other extremity of the horizontal bar is mounted upon the crank arm of a rod that extends along the track underneath the same and

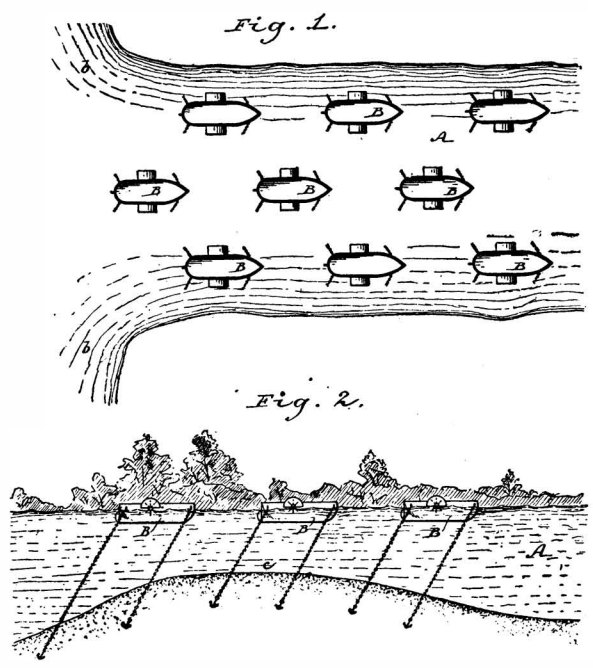


WOLFE'S AUTOMATIC RAILROAD SWITCH.

which is mounted in suitable bearings. A lever is pivoted to the track and bears upon a crank arm that is bolted to the other extremity of this revoluble rod when the side track is open. This lever is raised above the level of the track in such a manner that when a car is passing over the track the lever will be depressed, and by this means will rotate the longitudinal rod which shifts the horizontal rod to the left, and will open the main line. A guard rail (not shown in the cut) may be placed parallel with the lever to prevent its being depressed by the passage of wagons or trucks across the rails. It will thus be seen that a cable car in approaching the switch will open the main line by depressing the lever; but should a horse car approach, and it should be desirable to use the side track, the switch will be set for the side track by walking the horse onto the platform and depressing it.

### PRODUCING ARTIFICIAL CURRENTS.

A novel method of removing or preventing the formation of sand bars at the entrance of harbors, inlets, or rivers has been patented by Mr. Joseph C. Coult, of Crockett, Tex. It is designed by artificial means to increase the flow of the current at certain points, and thus to wash away the accumulation of matter, and have it carried away by the currents that have helped to form the bar. These bars are usually formed by the meeting of two opposite currents. An incoming current from the ocean and an outflowing current from the river meet with about equal force at a certain point, and any material carried by these currents will be deposited at that point, forming a bar. Now, if the force of the outgoing current can be increased so as to be greater than the counteracting current at one or more points, this accumulation will be prevented and the bar gradually worn away. In order to attain this, vessels are anchored in close proximity at some point near the bar, and their propellers are then driven at a high rate of speed. A swift current is thus produced, and this will be increased by the auxiliary currents pro-




COULT'S METHOD OF PRODUCING ARTIFICIAL CURRENTS.

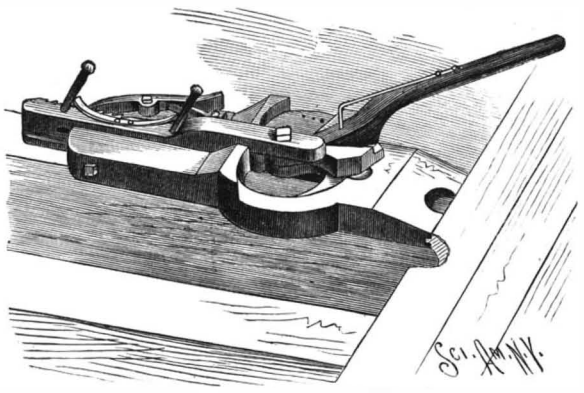
duced by the movement of so large a body of water out of the harbor.

### Power and Speed of the Baltimore.

A telegram from Philadelphia, Pa., states that the horse power calculated from the indicator cards taken during the recent official trial of the Baltimore falls short of that required by contract. The contract calls for 9,000 horse power. The indicator cards, as computed, it is said, show 8,968. The boilers were intended to carry 135 pounds of steam pressure, but, as the high speed tended to make the boilers prime, the pressure was reduced to 120 pounds, and slowing down was resorted to to prevent priming. The board paid little attention to the speed, but, after working out the horse power, think that the high speeds reported were probably incorrect.

### DIX'S FLOOR JACK.

The floor jack represented in the accompanying illustration is designed to facilitate the laying of floors and ceilings, and is so constructed that the boards may be quickly jacked up and readily released when desired. The device consists of two parts or sections. The central section is secured firmly to the beam by nails or spikes, and the outer section slides upon the inner section. The latter is essentially rectangular in shape, and is provided at its outer end with an inclined bearing face having a grooved edge, which fits into the tongue of the flooring, and a cup-shaped recess at its center to facilitate the driving of nails. This section is provided centrally with a T-shaped slot, which guides its movement along the fixed section. It is also provided near its center with a cam-shaped rabbet for a purpose presently to be described. At the end of the sliding jack bar is pivoted a vertical roller, and a hook-shaped dog is pivoted at the end of the jack bar, in close proximity to this roller. This dog has a cylindrical outer surface, which bears against the walls of the rabbet, and which is actuated by the handle shown, so that when the handle is thrust in the direction of the floor to be laid the cam will bear against the side of the rabbet and will force the sliding section against the flooring, holding them closely together while being nailed. The handle is provided with a spring which passes through it and the end of which may be inserted in apertures in the cam rabbet for locking the same when desired. The outer end of the sliding section is provided with a pawl, which is forced by a spring against the extremity of the jack bar, which has a serrated edge, so that when the sliding section has been forced out as far as possi-



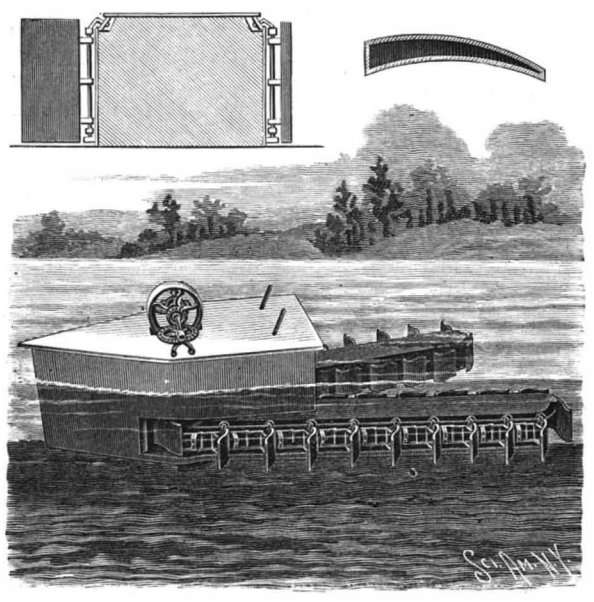
DIX'S FLOOR JACK.

ble, it will be held in locked position by the pawl engaging the teeth of the jack bar. The spring represented on the top of the jack bar is used for retaining the spikes in position and preventing their falling out when the device is inverted when in use on the ceiling.

This device has been patented by Mr. Joseph Dix, of Abbotsford, Wis.

### BESEMER'S WATER MOTOR.

An improved form of current motor has recently been patented by Mr. Andrew A. Besemer, of Tecumseh, Mich., and is illustrated in the accompanying cut. The object of the invention is to utilize the currents of streams where there is not sufficient fall to permit the use of ordinary turbines or water wheels. The motor is made perfectly V-shaped, the prow-shaped end being designed to head up stream and being constructed of solid material or masonry, so as to break the force of the current and prevent ice, logs, or other floating material from destroying the machine. It is provided internally with drums or sprocket wheels, over which passes the endless belt which bears the buckets shown, which drums terminate at their upper extremities in beveled gear wheels, that in turn engage with vertical gear wheels that actuate the driving pulley. The two diverging wings are also made of some strong material to withstand the force of the current and to present an even surface, over which the endless carrier will easily pass. The buckets are mounted on endless chain carriers, and are so mounted thereon that they fold against the side when passing up stream, but will be opened by the force of the current when being carried in the same direction as the stream. The endless chain is provided with rollers to prevent friction as much as possible against the sides of the piers. A channel is formed around the upper surface of each pier, and the upper friction rollers that are journaled on inwardly projecting arms are confined within this channel, as represented in the transverse section of the cut. It is thus seen that there is little loss from friction, and a continuous rotary motion will be imparted to the driving pulley. This power may be utilized in any desired way,



BESEMER'S WATER MOTOR.

and may be transmitted to shore by shafting or ropes or may be used directly for storing or producing electric currents. A number of these machines may be placed in the same stream, and in this case they should be staggered instead of being placed in line.

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### MULTIPOLAR DRUM DYNAMO.

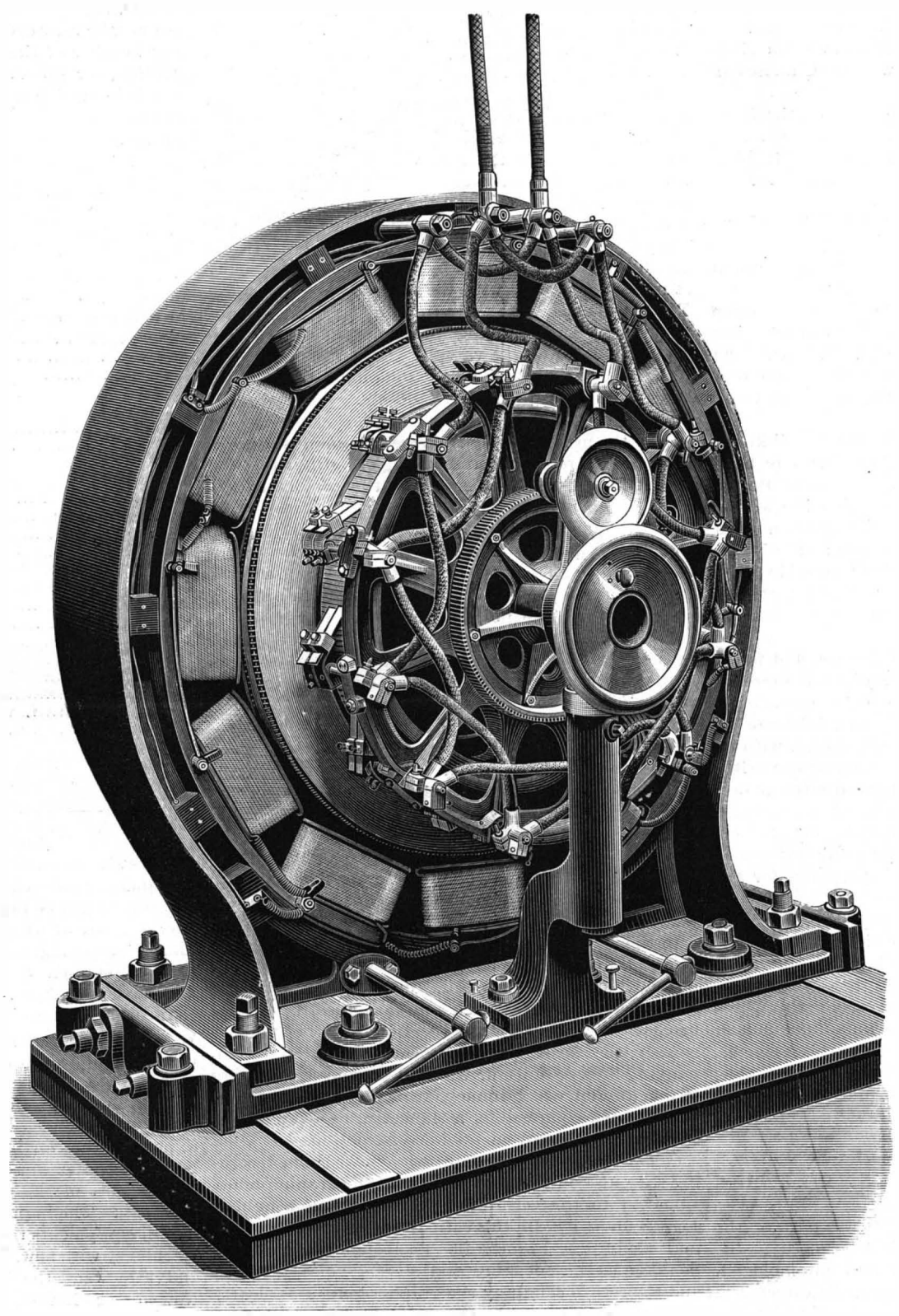
We illustrate herewith a type of machine which has been adopted by the Berlin Electrical Company for their large direct-driven steam dynamos. The design differs considerably from that of the steam dynamos adopted by the American Edison Company, and may be considered as the inverse of the new type of multipolar dynamo made by Messrs. Siemens & Halske, of Berlin. At first sight the necessity of developing new types of dynamos is perhaps not quite obvious, since the existing type of two-pole drum machine is giving excellent results, and in point of efficiency and low cost of manufacture leaves hardly anything to be desired.

It has, however, been found that the ordinary two-pole drum type, although excellent for small and moderate sized machines, is not so advantageous when applied to very large machines, and hence we find that on the Continent, where the average size of machine is larger than in England, there is a growing tendency to adopt multipolar designs. The machine we illustrate is intended for an output of about 60 kilowatts, when driven at a speed of 200 revolutions per minute. The armature is 49 in. in diameter by 10 in. wide on the face, and is drum-wound, the coupling up being either on the series or parallel system according to circumstances.

The armature core in some cases is provided with Pacinotti projections, and to avoid heating of pole pieces a thin wrought iron cylinder or shell is inserted between the armature and the polar faces, and attached to the latter. The armature thus revolves within a complete wrought iron casing, and a certain loss of induction takes place by leakage through this casing from pole to pole; but, on the other hand, the machine can be built with an exceedingly small, that is to say with a merely mechanical, clearance; and there is no danger of heating the field poles by the surging of lines due to passage of the Pacinotti projections in front of the poles.

To provide for ventilation, the cylindrical shell is perforated with a number of holes placed between the poles. In other machines, a smooth armature core is employed, and then the shell is omitted. The machine we illustrate belongs to the latter class, and is wound on the parallel system of connections for a total current of 500 amperes and a terminal pressure of 110 to 120 volts. The field has 12 poles, and the current is taken off by 12 sets of brushes, the commutator being exceptionally large. Equipotential brushes are connected by insulated cables as shown, and the brushes can be shifted simultaneously by means of a hand wheel and spur gear carried on a standard in front of the machine.

The armature is overhung on the crank shaft of the engine, and the total weight of the machine without the engine is about seven tons. The total weight of copper is about 9 cwt., and the loss of pressure in the armature at full current is 3½ volts, while about 3½ per cent of the total energy is required for excitation. From the figures we have here given, it will be seen that the design is very advantageous as far as efficiency and weight of materials are concerned. The electrical efficiency is about 93 per cent, and the dead weight of the whole machine is only 1½ cwt. per h. p. output, a very fair result when the low speed of 200 revolutions per minute is taken into account.—*Industries.*



IMPROVED MULTIPOLAR DRUM DYNAMO.

### The Germ of Yellow Fever.

Dr. George M. Sternberg, surgeon in the United States Army, has just retured from a six months' stay in Cuba, where he has been continuing his researches with reference to yellow fever. He has brought with him specimens of microbes, with which he will continue his investigations during the winter at the Johns Hopkins University. At the end of this time he hopes to present a general report of his investigations to President Harrison. "My researches," says Dr. Sternberg, "have not led to a positive demonstration of the specific cause of the disease; but I have isolated a considerable number of pathogenic bacilli, disease-producing germs, from the intestines of yellow fever cases, and have strong hopes that one or more of these may prove to be the specific germ. I have confirmed my previous conclusions as to the absence of a specific micro-organism in the blood and tissues of the patients, and have failed to find in any of my cases the germ which Dr. Frere, of Brazil, has claimed to be the cause of the disease. For this reason I have given my attention entirely to the bacilli of the alimentary canal."

### California Irrigation.

The new Wright irrigation law, the constitutionality of which has recently been affirmed by the Supreme Court, has given a wonderful impetus to the settlement of the Sacramento and San Joaquin valleys. A few years hence will see a great increase in their population.

The new law provides that fifty freeholders may petition a board of county supervisors for the formation of an irrigation district. The board then meets, makes an estimate of the necessary expense for providing water, and calls for an election to vote upon the establishment of the district and the issuance of county bonds to defray the expenses. A two-thirds vote is necessary. If parties having riparian rights object to the confiscation of their water for what may be considered a just compensation, it may be condemned by right of eminent domain.

In Colusa County three districts have already been formed, and bonds to the amount of $325,000 issued. The new districts already formed in the San Joaquin valley will irrigate 1,620,000 acres at an estimated cost of $600,000 for the dam, main canal, and lateral branches.

Irrigation once established throughout the two valleys mentioned will increase the present cultivated area of the State at least one-half.

### Trial of the Dynamite Gun.

The long-delayed official test for rapidity of fire of the dynamite guns of the cruiser Vesuvius was completed in the channel of the Delaware, eastward of Petty's Island, October 9, and, according to all accounts, with satisfactory results. Commander Goodrich, chairman of the trial board, telegraphs the Navy Department that the test was successful to a degree not anticipated. The details of the trial are thus described by an eye witness:

After firing a few dummy shells to note the action of the firing valves, the trial began. One regulation shell was first fired from each gun to satisfy the requirement as to the range. These shells are about 7 feet long and 10 inches in diameter, hold 200 pounds of explosive gelatine, and weigh 483, 504, and 505 pounds respectively. All three were as steady in flight as a shell from a high-powered rifle. With a loss of pressure of 105 pounds in the firing reservoir the first shell fell 32 yards beyond the mile buoy; with a loss of 80 pounds, the second fell 250 yards over the line; and the third, with a loss of 73 pounds, ranged 100 yards beyond the buoy. The time of flight was between 11 and 12 seconds. This demonstrated conclusively that a loss of 70 pounds in the firing reservoir would satisfy the contract as to range.

It now remained to test the rapidity. The projectiles used in this test were not of the regulation pattern, but they weighed between 20 and 50 pounds more, being full caliber wood and iron dummies. It was not expected that these dummies would be steady in flight, as the center of gravity was not at the proper point to insure steadiness, but they answered all purposes in testing the operations of loading and proving the capacity of their reservoirs. The expense of using the regulation shell for this purpose would have been very great and quite unnecessary. Having steadied the ship in position in order that the firing in the narrow channel might not be interrupted, the word was given to begin the trial for rapidity. The port gun was first used.

Starting with a shell in the gun, five shots were fired from the gun in 4 minutes 23 seconds, the losses of pressure in the firing reservoir at the different discharges being 70 pounds, 74 pounds, 74 pounds, 76 pounds, and 78 pounds respectively. The variation in the loss of pressure was due to the fact that the dummies vary several pounds in weight.

The middle gun was then tried, and starting with the gun unloaded, the five shots were fired in 4 minutes 48 seconds. The losses of pressure in the firing reservoir were 105 pounds, 109 pounds, 114 pounds, 104 pounds, and 96 pounds respectively.

Five shells were next fired from the starboard gun in 6 minutes 58 seconds, the losses of pressure in the firing reservoir being 118 pounds, 112 pounds, 105 pounds, 120 pounds, and 118 pounds respectively. With one shell loaded in the port gun, therefore, the 15 shots were fired in 16 minutes 9 seconds; or, taking into consideration the time necessary to load all 15 shells—that is, starting with the three guns empty—the 15 shots were fired in 16 minutes 50 seconds.

When the test began, the air pressure in the storage reservoirs was 2,000 pounds per square inch. After the 15 shots had been fired, the pressure was between 1,200 and 1,300 pounds per square inch, which was sufficient for at least 10 shots more. Had the air pumps been kept running during the firing, 5 more shots could have been provided for. It is thus demonstrated that the Vesuvius can fire 30 shells—all she can carry—without stopping to fill the air reservoirs. This is double the capacity demanded by the contract, and the rapidity was nearly twice as great as was required.—*Army and Navy Journal.*

IT is estimated by Mr. Webb, of Crewe, that the quantity of steel removed from the rails throughout the London and Northwestern system by wear and oxidation is about 1,500 lb. an hour, or 18 tons a day.

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### The Cinnamon Trade of Ceylon.

The present condition of the cultivation of and trade in cinnamon is discussed in a recent issue of the *Ceylon Observer*, of Colombo. In the days of the Dutch monopoly, the Ceylon cinnamon, by far the finest in the world, first-rate bark was sold at a pound sterling for a pound in weight, and as late as 1830 the average price of Ceylon cinnamon in the London market was as high as 8s. per pound.

But with the abolition of the monopoly and the consequent enormous increase in the export the price has fallen, so that the price last year was only 1s. 3d. per pound.

In the monopoly days the average export from Ceylon rarely exceeded half a million pounds; but with the removal of restriction the exports rose to about three million pounds. This included not only the baled spice, but also "chips," previously worked up in the distillation of cinnamon oil.

The large proportion of these chips introduced into the market at last reduced the splendid Ceylon cinnamon to the level of a competitor with the Chinese bark known as cassia lignea.

A combination a few years ago to restrict the export of chips failed; but a new one is being formed for the purpose. Growers have been driven to take this step by the constantly falling price, which was recently down to 9d.

Cinnamon bark is used to flavor chocolate and puddings; it is an ingredient in the incense used in some religious buildings, and is a constituent of some patent foods for cattle.

In medicine and confectionery the bark and essential oil are used to some extent, while it is combined with sulphur in a new mode of preserving meat. Except, perhaps, in this last direction, there is no prospect of increased consumption of the famous and once costly Ceylon spice.

In some parts of Ceylon, especially in the well-known cinnamon groves near Colombo, the shrub is being cleared away to make room for the cocoanut. Besides pledging themselves not to trade in chips, the leading planters agree also not to manufacture cinnamon leaf oil, in the interest of the fine aromatic oil distilled from the cinnamon bark, chips being the residue. The two oils are wholly different in quality and taste, yet attempts have been made to adulterate the bark oil with that from the leaf.

The latter somewhat resembles clove oil, and is employed to rub inside the covers of books as a preservative against fungi and insects.

It would seem almost impossible to adulterate the bark oil, with its peculiar and delicate flavor, with the leaf oil, for the coarse and pungent odor of the brittle leaves of the cinnamon tree as compared with the delicate aroma of the bark and its oil is one of the peculiarities of the plant; yet when one sees the delicate citronella and lemon grass oil of Ceylon adulterated with such a substance as kerosene, one is prepared for any kind of adulteration.

The Cingalese prepare from the roots of the cinnamon a substance like camphor, which is made into candles for festive occasions. The bark of the cassia plants of China is greatly inferior to the Ceylon cinnamon, but the leaves have a pleasanter scent; this China cassia is supposed to be the cinnamon of the Mosaic and other ancient writings. However this may be, the Ceylon cinnamon, once so famous and so valuable, has fallen upon evil days, and now, like the silver in Solomon's time, is "little accounted of."

### National Reward to Emile Planchon's Widow.

A petition has been originated by the Hérault Agricultural Society, and signed by some thirty like associations throughout France, praying that a part of the unclaimed 300,000f. phylloxera prize be granted to the widow of the well-known botanist and entomologist. E. Planchon, the brother of Gustave, the director of the Paris College of Pharmacy, died suddenly, less than a year since, at Montpellier, where he held several important positions, among them that of professor at the College of Pharmacy. When a young man he had been for some years in charge of the herbarium at the Kew Botanical Gardens, and when the phylloxera plague broke out in French vineyards, he was the first to identify the insect and describe its full history and metamorphoses. His knowledge of English and special qualifications naturally suggested his selection when it was decided in 1873 to send a scientific mission to America to study the insect pest at its birthplace. The outcome of his investigations was the plan of importing phylloxera-proof American stock, and grafting them with native scions. The scheme has been successful wherever applied, and, thanks to Emile Planchon, phylloxera may be said to have been now baffled. Unfortunately this does not fill the conditions of the prize, which is not likely to be claimed at present, when hardy Yankee stock is living on good terms with its old acquaintance phylloxera. As the deceased scientist in an indirect manner contributed to the object aimed at in the bequest, it is now proposed to grant to his widow a life income of 5,000f., as a national reward, from the phylloxera fund.

### The Graphophone in Medicine: A New Addition to Medical Art in Diagnosis.

While observing the graphophone in action some months ago, it occurred to me that it might be possible to turn it to good account in medical art and practice. I therefore, through the kindness of Messrs. Glover, obtained the loan of an instrument, with which I have been able to experiment, and to secure certain new and, I think, useful results.

*Pulse Reading by the Graphophone.*—I commenced the inquiry with the pulse, in order to ascertain if a reading of the pulse could be taken and permanently recorded on the wax cylinder from the sounds produced by pulse movements through the sphygmophone. In the sphygmophone, as I originally constructed it, the needle marks out the pulse curves over a plate of carbon or of metal inserted in the circuit of Professor Hughes' microphone. I mount on a slip of talc, glass, wood, or ebonite a plate of metal or of gas carbon, and place it as if about to take a tracing of the pulse by the sphygmograph. Then I connect one terminal from a battery of one or two cells to the metal or carbon plate, and the second terminal from the battery to one terminal of a telephone. Lastly, I connect the other terminal of the telephone with the metal rod of the support which carries the needle that is moved by the pulse. When the needle, under the pulse movements, makes its tracing on the carbon or metal plate, it completes the connection between the telephone and the battery, and in the act causes a distinct series of sounds to be produced by the telephone, which sounds are in accord with the movements of the pulse. The sounds heard are three in number; one long and two short, corresponding to the systolic push, the arterial recoil, and the valvular check or chuck.

Of late, in using the sphygmophone, I have discarded the microphone, having found a mode of working with sufficient clearness, for clinical purposes, by letting the needle simply traverse a resonant surface of parchment stretched across a ring of light metal; but this yielded too feeble a sound for the present experiment. The battery was therefore again resorted to, with the microphone, as in the first adaptation, and the battery power was so increased that the sounds emitted through the telephone from the pulse movements were as loud as the human voice in ordinary conversation. The pulse was in this way made to record its action through the mouth of the telephone to the mouthpiece of the graphophone, so as to write its record on the revolving wax cylinder, and the record written, the graphophone was made to give it back in sounds, which came out in the most distinct manner. The three pulse sounds were as clear, when there was perfect stillness, as they were from the sphygmophone direct, and the record remained in such permanency that many hundred repetitions of it could be secured and repeated in any part of the world at the will of the possessor of the cylinder on which it was traced, if the graphophone were at command to develop it. In one demonstration at least a hundred persons heard the tracing of a pulse quite distinctly.

In the manner described I have now taken impressions on the wax cylinder of several varieties of pulse: intermittent, irregular, full, quick, slow; and the respective qualities of each are easily heard. To the process only one serious objection can be taken—namely, that with the pulse beat there is an accompanying buzz or murmur which is produced by the instrument, and which somewhat troubles the listener. This complication will, it is expected, be overcome in the course of improvements in construction.

*Cough Reading by the Graphophone.*—From recording the pulse on the wax cylinder of the graphophone, I moved to the recording of coughs and coughing sounds upon it. In this case the results were exceedingly definite and practical. The cough has simply to be taken as the speaking and singing voice is taken, and the return cough by the graphophone is as clearly distinct as the original. On one cylinder I took four varieties of coughs—namely, a loose bronchial, an asthmatic spasmodic, a dry bronchial, and a barking and hacking cough. In listening to these coughs it is difficult to divest the mind of the belief that it is not the patient, actually, who is producing the effect by his own present efforts.

*Cui Bono?*—To what service the facts related above may in course of time be applied it is difficult to say, for this is the first word on the subject, the mere mite in science, which, like the mite in charity, has to be taken rather for the worth of the intention than for any immediate or real practical application. Out of a roll of paper, accidentally used by Laennec, the stethoscope was elaborated, and a new mode of diagnosis, widest perhaps of any, was brought into existence, a truth which proclaims that out of the simplest of simple things the greatest may arise. It may be so here.

In regard to the pulse, it may fairly be said that when a sphygmographic tracing, readable by the eye, can be fixed on paper and sent by post anywhere it is needless to fix a similar record on a wax cylinder in order that it may be placed in another instrument to be received by the ear. Still, as I have shown elsewhere, there are some special advantages in the sphygmophone which have yet to be appreciated, and which the plan I have described makes permanent. Therefore, I would not throw away what little has been gained respecting the pulse because it is little.

On the matter of the cough record much may at once be said in its favor. To be able to compare a cough of to-day with a cough of a month or a year ago is a very good clinical advantage, and may be so immediately available in the consulting room that I have determined to bring it into practice in mine. For lecture purposes also this part of the work would be most useful, since every class of cough could be taught to the student by direct practice and demonstration.

Finally, the different kinds of cries indicative of different sensibilities to pain can be rendered diagnostically. In a word, any sound whatever indicative of health or disease, and any animal motion of health or disease, that admits of being translated into sound, can now be recorded, made permanent, and reproduced any number of times, either for comparison, demonstration, or observation. The utilization of such a power in medicine, once gained, must, I think, be continued until it reaches all the greater departments of our art.—*Dr. B. W. Richardson, in The Asclepiad.*

### New Railroad Construction in 1889.

The accompanying table shows the new track laid in the United States, Canada, and Mexico during the nine months from January 1 to October 1, 1889. The table also shows the lines reported as under construction. The new mileage is, by States, as follows:

| | | | |
|---|---|---|---|
| Alabama | 65·2 | New York | 111 |
| Arkansas | 9 | North Carolina | 210·5 |
| California | 97 | Ohio | 44 |
| Colorado | 80·5 | Oregon | 7·1 |
| Connecticut | 0·5 | Pennsylvania | 105·7 |
| Dakota | 30·8 | South Carolina | 31·7 |
| Florida | 85·4 | Tennessee | 151·8 |
| Georgia | 205·7 | Texas | 167·5 |
| Idaho | 7·1 | Utah | 10 |
| Illinois | 58·5 | Virginia | 124 |
| Indiana | 102 | Washington | 254 3 |
| Indian Ter | 107 | West Virginia | 59·8 |
| Kansas | 56·2 | Wisconsin | 40 |
| Kentucky | 141·5 | Total United States | 3,111·3 |
| Louisiana | 75 | | |
| Maine | 21 | Manitoba | 103 |
| Maryland | 4·8 | New Brunswick | 45·2 |
| Michigan | 76·5 | Nova Scotia | 99 |
| Minnesota | 60 | Ontario | 127 |
| Mississippi | 203·5 | Mexico | 265 |
| Missouri | 86·8 | Total foreign | 639·2 |
| Montana | 76·9 | | |
| Nebraska | 65 | Grand total | 3,750·5 |
| New Jersey | 52·5 | | |
| New Hampshire | 25·5 | | |

—*Railroad Gazette.*

### Lumber Machinery.

The enormous amount of machinery for saw, shingle, and planing mills that is being constantly turned out and sold might be taken as evidence that, rapid as has been the rate at which timber has been converted into lumber and shingles, the thirst for money was so great that lumbermen were multiplying and reaching out, and that the standing timber was bound to go faster than ever, in spite of all that could be said. Such a view would be only partially correct. True it is that men are ambitious to make money where it has been made before. Thus old plants are enlarged and new ones established. But the opening up of new regions—not only in the South and on the Pacific coast, but in parts of the Northwest, where railroads have tapped bodies of timber not hitherto accessible—accounts for a large part of the demand for new machinery. Nor is this all. The improvements being made all the time in mill equipments result in the replacing of much old machinery with new. Most lumbermen are wide-awake, and they want the best appointments of all kinds. New mills go in fast, but the rapidity with which the country fills out and expands calls for some increase in facilities for lumber manufacture, the trouble being that where there is a promising opening for manufacture, the thing is pretty sure to be overdone.—*N. W. Lumberman.*

### How to Tell Good Oats.

Good oats are clean, hard, dry, sweet, heavy, plump, full of flour, and rattle like shot. They have a clean and almost metallic luster. Each oat in a well-grown sample is nearly of the same size. There are but few small or imperfect grains. The hard pressure of the nail on an oat should leave little or no mark. The kernel when pressed between the teeth should clip rather than tear. The skin should be thin. The size of the kernel will be less in proportion than the skin is thick. The color of the oat is not very material, but white oats are generally thinner in the skin than black. Again, black oats will grow on inferior soils. Short, plump oats are preferable to large, long grains. Bearded oats must have an excess of husk. Oats are not necessarily bad because they are thin-skinned or bearded; but they must contain a less amount of flour per bushel than thin-skinned oats without beards.

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## Correspondence.

### The Green Fir.

*To the Editor of the Scientific American:*

In the SCIENTIFIC AMERICAN of September 28, I noticed an article about "The Green Fir," in which the correspondent stated that it "will burn like tinder." Having lived for twenty-four years in the Territory, I known something about the fir tree. If a hole, downwardly inclined, be bored deep into a green fir, and another hole be bored in to meet the first near the bottom, the tree may readily be burned down by the application of fire; but a hot fire may be kept up around the base of a sound, green tree for a considerable time and not even injure the tree. Fir trees are not killed by forest fires unless the flames attain sufficient height and heat to deaden the branches. An unsound tree may be burned down by outside fire, but fire must be applied to the interior of a sound tree in order to burn it.

GEORGE C. STOCKING.

Grand Mound, Wash.

### The Smoke Nuisance.

The city of Chicago has a periodical agitation in regard to the smoke nuisance, and during the present excitement it has been proposed that the city buy the right to use some good patented device for the prevention of smoke, then offer it to the citizens without royalty, and compel them to abate the smoke nuisance either by adopting the device so provided or by any other effective means which the owner of the steam plant may see fit to use. Such a measure as this is wholly unnecessary. The whole trouble lies in the fact that much soft coal is consumed in the city and that the simplest laws of combustion are wholly ignored. In this respect the coal consumers of the city are much like a number of railways in the country. But little attention is paid to the laws of combustion, and smoke prevention is only taken in hand when the smoke becomes a positive nuisance, and even then it is doubtful if some realize that its prevention may be a means of great economy.

Patented devices, while they may be very good, are by no means necessary for the prevention of smoke in a locomotive or in a stationary plant. An intelligent fireman may solve the problem with but little expense to his employer by admitting air through the fire door and placing a deflector just inside of it, or by some other simple and inexpensive manner dependent upon the construction of the furnace. It is strange how little interest there is among coal consumers in regard to the matter. A change was recently made in a furnace by inserting a number of air tubes through the brick work in much the same manner as they are put in a locomotive firebox, and the chimney, which had previously emitted a large amount of smoke, was almost clear, but the owner never had a single inquiry from the proprietors of neighboring chimneys as to the means by which he prevented the formation of smoke. Perhaps they were so enveloped in their products of combustion as to be unable to notice the absence of the customary stream from their neighbor's chimney.—*Railway Review.*

### Vacant Farms in Vermont.

A rather sad story is told by Mr. Valentine, a Vermont official, about the desertion of that beautiful State by its former inhabitants. Standing with other officials on a hill in Bennington County, and looking over the valley of the West River, a tributary of the Connecticut, they counted fifteen contiguous farms, of perhaps a hundred acres each, all fenced, and with dwelling houses and barns in at least tolerable condition, without a single inhabitant. Beyond, toward the Connecticut, but hidden by the maple groves in the valley, were, as they knew, fifteen more, also deserted, yet all well situated and still showing signs of their former fertility. Statistics show that a similar condition prevails all over the State. In Windham County alone are more than forty thousand acres of land, once cultivated, but now deserted, and in the whole State the number of abandoned farms, complete with houses, fences, barns, and outbuildings, must be several thousand. Yet Vermont is one of the pleasantest, healthiest, most fertile, and most civilized States in the Union. In its river valleys is no malaria, while its hills are covered to the summit with vegetation. The reckless agriculture which has made portions of the South nearly barren has never been favored in Vermont, where a century or more of stock farming has rather enriched than exhausted the soil; yet the people who once found happy homes there have crowded into the towns, or have left the State altogether. In thirty years, from 1850 to 1880, the increase of population in Vermont was five per cent, while the population of the whole country more than doubled, and that of the adjoining State of Massachusetts increased by nearly eighty per cent. Not pretending to any ideas on political economy, we will not try to account for this strange condition of things, but it is certainly curious that a region so favored in climate and position should be retrograding so rapidly.—*Amer. Architect.*

### Great Blasts.

It was recently decided, in view of the large and steady demand upon Mr. P. Callanan's quarry, South Bethlehem, N. Y., near Albany, to put in a blast heavier than any yet tried there, and blow down the whole face of the cliff at one explosion. It was calculated that the blast would displace at least 20,000 tons of rock. The steam drills were put at work, and 50 holes were bored to a depth of 30 feet. These were charged with about 40 pounds of dynamite each, a total charge of 1,950 pounds. The holes extended along the ledge for a distance of 350 feet.

On the afternoon of September 2, about 3,000 people, among whom were many prominent engineers, gathered on the surrounding bluffs to watch the proceedings from a safe distance.

At 6.30 o'clock the electric circuit was closed and the explosion took place. The whole face of the cliff was thrown down, breaking it into pieces from the size of a freight car down. The amount of rock displaced by this blast is estimated at from 20,000 to 25,000 tons. Although the crushing plant is quite near the face of the work, no damage was done, the rock being so tough that the force of the explosion was spent in breaking it up, and there were consequently very few flying fragments.

Of course, in comparison with the Hell Gate blast in 1876 and the Flood Rock in 1885, this blast is insignificant. At the Flood Rock explosion, 240,000 pounds of rack-a-rock and 40,000 pounds of dynamite were fired, by far the greatest quantity of explosive ever used in one blast, and about 400,000 tons of rock were broken up.

In England, however, there have been several open air blasts far greater than the one illustrated in our engraving. In 1843 the Round Down cliff, a chalk precipice 375 feet in height, near Dover, England, was blown down with gunpowder to form a passage for the Southeastern Railway. In this charge 18,000 pounds of gunpowder were used, which was placed in three chambers, located from 56 to 72 feet from the face of the cliff. The quantity of rock displaced by this explosion was estimated at 400,000 tons, or over 22 tons per pound of powder.

In 1850 a chalk cliff about 200 feet high, near Seaford, on the coast of Sussex, was thrown down by the explosion of 24,000 pounds of powder, and 292,000 tons of rock were dislodged.

At Holyhead in 1850, a hard quartzose schist cliff was thrown down by 12,000 pounds of gunpowder. About 40,000 tons of rock were dislodged, which was used for the harbor works at that point. In January, 1867, another blast was fired at the same place, in which 16,000 pounds of powder dislodged 120,000 tons of rock.—*Engineering News.*

### Sewage Treatment.

In the various systems of sewage treatment that have been introduced from time to time, the principle generally adopted has been to treat the sewage at the point where it is collected for deodorization and disposal. This necessarily involves the unchecked formation of gases in the sewers through which the sewage passes, and which gases have to be dealt with by ventilation—which means their emission into the atmosphere—or by other means.

After having devoted several years to the practical study of the question, Mr. E. Harris Reeves claims that he has perfected a system of sewage treatment which goes to the root of the evil. He deodorizes the sewage as it is run into the sewers from the houses, or even attacks it in the houses themselves, and thus prevents the formation of sewer gases; but if they should be formed, they are at once rendered inodorous and innocuous.

This is effected by placing in the manholes in the streets a small earthenware apparatus containing two chemicals, which, in combination, act simultaneously on the gas present in the sewers and on the sewage itself.

The chemicals employed are strong sulphuric acid and a solution of manganate of soda, which are automatically mixed and give off sulphuric acid gas and nascent oxygen. Of these two gases, the former is a complete destroyer of putrefactive and contagious organisms, while the latter is a perfect deodorizer. The solution formed by the union of the two chemicals consists of a liquid containing a large percentage of permanganic acid and a small quantity of sulphuric acid. This solution overflows into the sewer from the chamber in which the admixture takes place, and deodorizes the sewage to a greater or less extent on its way to the precipitating tanks. At the same time, whatever gases are evolved from the sewage are neutralized by the chemical gases, for to reach the outer atmosphere the sewage gases must pass through the chamber in which the chemical gases are generated.

We recently inspected Mr. Reeves' apparatus at Putney, where it has been applied. Its chief application, however, has been at Frome, where it is in extensive use, with every success, as certified by the engineer to the local board, after nearly a year's experience of its working.

He states it to be a simple and efficient method of sweetening the sewers by the destruction of the sewer gas, and at the same time of deodorizing the sewage on its way to the precipitating tanks.

The deposit in the tanks is stated to be devoid of smell and very valuable as a manure, while the effluent is clear and odorless and fulfills the ordinary tests for purity.—*London Times.*

### French Engineers on American Bridges.

The Societe des Ingenieurs Civils recently discussed this question, and an account of the discussion, published in the *Revue Industrielle*, may be of interest, as showing what foreign engineers think of American methods:

The new systems of construction employed in America for metallic bridges are well known. One of the most noticeable bridges is that at Poughkeepsie, on the Hudson, which was opened last year. Rivets are very sparingly used, large pins being substituted, thus rendering the erection of the trusses more economical and rapid. The metallic portion of the large bridge at Poughkeepsie was erected in a few months. Mr. F. De Gazay mentions, in a communication which he has just made to the Societe des Ingenieurs Civils, a still more extraordinary example. The large bridge at the base of Niagara Falls is 200 feet above the river, with central spans, 480 feet long, of the same system as those used in the bridge over the Hudson. The shop work and erection of the Niagara bridge were completed in the short space of nine months and a half. The dimensions of the Poughkeepsie bridge are given, followed by the statement that this work was erected very rapidly and economically, notwithstanding its magnitude. Four of the spans are rigid trusses, which were erected upon false work resting on enormous piles driven into the bed of the river near its center. The three remaining spans were erected without scaffolding or other false work, according to the new system called by the Americans "cantilever."

To illustrate the great economy and safety resulting from the simplicity of the American system, the author recalls the facts which occurred a few years ago on the Oroya Railroad, which crosses the Cordilleras at an altitude of more than 12,000 feet. At the Verrugas viaduct, three short spans on the Fink system, 100 feet long, were erected in 16 hours by a force of 50 men at a height of 275 feet above the ground. On the same railroad four spans, each 100 feet in length, were erected. Two were built by the English, with the old American Town truss. The erection required more than two months. When tested, the first one fell into the ravine. The second also broke down, when loaded, and fell upon the scaffolding, which had been left in place. The third bridge, of French construction, and whose lattice trusses were riveted, was erected in about a month, and sustained the test perfectly. The fourth, of American construction, on the Fink system, also sustained the test without injury. It had been erected *in five days*. An interesting fact to be noted is that the three European bridges each weighed 164 tons, while the American bridge only weighed 66 tons. These four bridges were of iron, and their prices must necessarily have been in proportion to their weights, apart from certain differences in the methods of construction.

After the reading of this communication, Mr. S. Perisse expressed the opinion that, when the question of time is a condition *sine qua non*, it is well to use American pinned bridges; but that, in all other cases, the preference should be given to riveted bridges. Even though pinned bridges sustain tests just as well as riveted bridges, there is reason to believe that the latter will be more durable, since the play which necessarily occurs between the pins and the holes is a sure cause of destruction that does not exist in riveted bridges.

On the other hand, to compare the economy of one system with that of the other, account should be taken not only of the weight, but also of the cost of construction per unit of weight, which, according to Mr. Perisse, must be much higher for pinned than for riveted bridges; but it is none the less true that the Americans know how to build fast and well.

Mr. Regnard remarked that people often make mistakes in talking about the pins of American bridges. They are not, properly speaking, bolts for tightening joints, but, more accurately, large joint pins of great diameter, turned and fitted to within two ten-thousandths inch to the holes in the parts which are to be united. As to the question of price, Mr. Regnard thinks that the American system ought to be very cheap on account of its lightness, and also because it is composed of parts which require little or no forge work.

AT a recent meeting of the Academy of Sciences of Paris, Prince Albert of Monaco drew attention to the fact that vessels running short of provisions might obtain food sufficient to support life indefinitely if provided with apparatus for collecting the surface-swimming forms.

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### India-Rubber in Carriages.

To promote ease and silence, India-rubber does not admit ready adoption or adaptation to carriage construction, though so serviceable in many ways. It is difficult to fit and fix, and will not admit of the usual embellishment of paint and varnish—oil contact destroys it—and as its fixing must be by cement or by gripping between two surfaces, this fixing must be confined to as little of the surfaces as possible, so as not to lessen its expansion or contraction under pressure, or its use is nullified to a corresponding extent. Coachmakers avoid its use all they can, for these reasons; but its yielding texture makes it a non-conductor of vibration, as well as an elastic medium for spring purposes. It cannot be used as a substitute for steel springs on roads as at present formed, as its yielding qualities are of more limited extent than the inequalities of the roads it would be used upon; and for insuring ease in a running carriage, its side swing has to be arranged for, and also the horse motion of starting and stopping more or less suddenly.

At present, no spring so fully fulfills the requirements of riders for resiliency as the one with the leather braces of sufficient length and draught, at an angle of about forty-five from the horizontal. With such braces, with the body so adjusted in relation to the springs at the points of attachment, absolute ease and silence prevail in a carriage over the roughest roads or the most jerky horse motion. The spring attachment to the brace, if made so as to prolong the resiliency, may be of bent wood or steel. The American bent wood C-shaped springs have the advantage of lightness and economy, though they are rarely to be met with now, even in America. Thus we see how essential for ease and silence is the shape of the spring and the degree of inclination of the brace suspension. If the brace is placed about vertical, in what is now known in the trade as the cheap work style, the easy-yielding sway is lessened, almost destroyed, yet it is not a whit cheaper than if properly hung, except it be the cheapness of incompetence in masters and men.

The first trials of India-rubber were as tires. These still prevail, and give silence inside a vehicle, but not the ease of C-springs. Their cost is high. They wear out rapidly on country roads, and add to the draught of a carriage.

The next important attempt was putting the axle box in a "sleeve" of India-rubber. This cut off vibration very much, but the almost unavoidable contact with oil from the axle with the "sleeve" soon destroyed it. In this contrivance, special boring machinery was requisite for boring out the nave exactly to size. It was not a failure, but it did not answer generally.

The third application of India-rubber to a wheel was to make the felloe rims of rubber, and shoe this with a double angle tire "[." The spoke ends had a corresponding tire, so that the rubber was held between the two. They were never exposed to any more wear than the abrasion by the nipping of the iron that encompassed them. The steel tire took the wear of the road, the rubber cut off vibration effectually. This was, and is, the best form of application of rubber to wheels yet tried.

The cheapest and most generally useful application of rubber was next adopted for spring ends, where the bolts join the "pipes" to the "cups" of elliptic springs, often as a "boss" with a vertical fixing; also for "round robins," and "cow mouth" shackles of cross springs; and the ends of bow springs and pipes of "swinging shackles." All effective in cutting off vibration, yet with the cheap work, the advantages were nullified by making the pipe eyes fit—steel to steel—to the cup ends, which at once communicates vibration to the rider of a carriage.

The next application of rubber was as spring blocks between the spring and axle fixing. This being a part where rigidity and perfect security of fixing is needed, makes it difficult; yet by a combination of butterfly flap arrangements it has been effectively accomplished and answers the purpose. Attempts have been made to apply India-rubber under the body loops and top carriage fixing, but they have been failures.

The last attempt of rubber use to cut off vibration comes to us from the unscientific daily and sporting press, with a flourish of praise that needs discounting from such sources. This attempt is at the wheel, by putting a ring of rubber, three-fourths inch thick and about four inches wide, round the nave for the spokes to go through and their shoulders to rest upon. Now, as it is a recognized principle that the spoke fixing in a nave must be unyielding, how is the rubber to yield to the shoulder pressure? Where is the resiliency or back-spring? There can be none. The inventor had better have asked a wheeler—there are plenty on tramp—than spend his money on unscientific press notices, and he would have learned that rubber must be used as an insulator. Any other contact in combination destroys this insulation.—*Carriage Builder's Gazette.*

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A PATENT has recently been granted for a process of separating buttermilk from butter, which consists in first melting the butter under sufficiently warm water by holding said butter in bulk below the surface thereof, next allowing the butter to rise in a melted state through the water, whereby the buttermilk is absorbed by the water, and then beating the pure butter which has risen to the surface into a froth, and finally allowing the froth to cool, whereby it becomes non-granular and solid.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

### THE PARIS EXHIBITION.

PARIS, October 1, 1889.

While there is evidence on every hand in the Palais des Machins of the copying of American designs, yet there are many differences in detail that call for remarks that are none too often complimentary if they are just. I am beginning to think that what is called human nature has a good deal to do with this, for if a draughtsman exactly copies somebody else's design, there is not much credit accorded to him; whereas, if he takes advantage of the principle of a machine and puts in his own details, he gets a good deal of credit from calling it his design, even though he fails to make a single improvement in the details. This remark applies with greater force in proportion as the machine copied is superior in principle to those in use in the shop where the copyist is employed. There are, no doubt, many cases in which the copyist really thinks he improves upon the original, but I can say that I find justification for this in this exhibition. While on this subject of copying designs, let me say that I heard that one of the principal English exhibitors of machine tools said the other day that he really felt that his exhibits were out of place in the English section, since they were nearly all of American design, and would, therefore, be much more at home if shown in the American section. The machinery not being shown in motion during the forenoon is a great obstacle to getting information here, as many exhibitors do not come in the morning, and during the afternoon the place is so crowded that one labors under difficulties, especially as many exhibitors have neither catalogues nor circulars, while those who have do not like to part with them unless they see a chance to make a sale.

Fig. 1

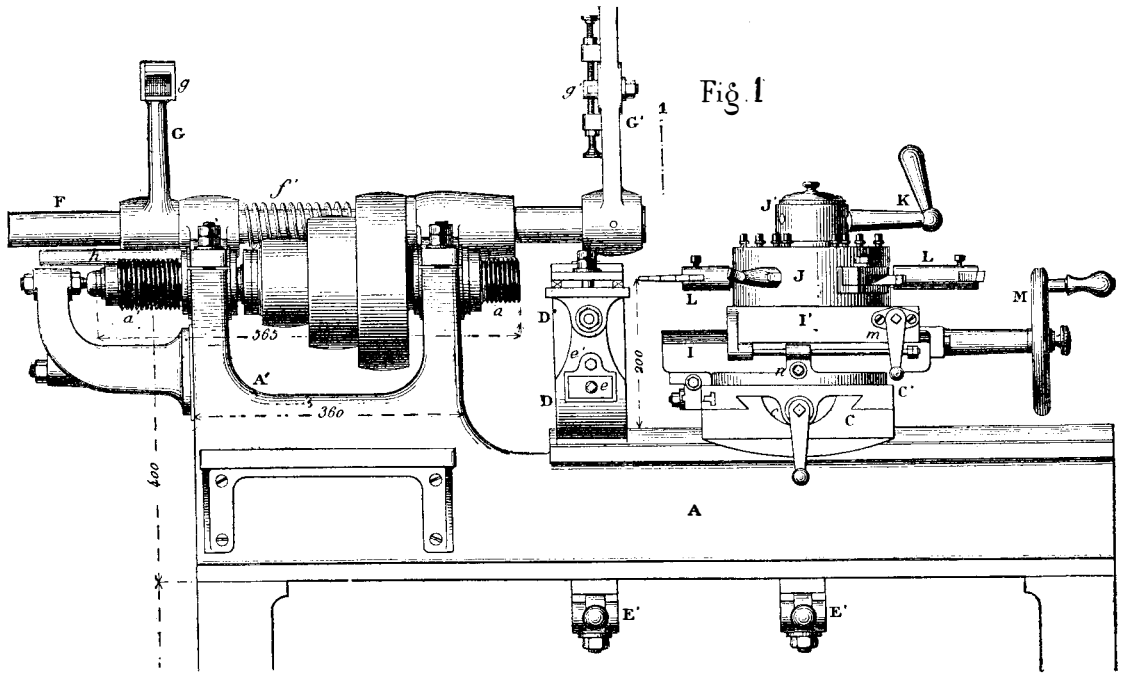



Fig. 2

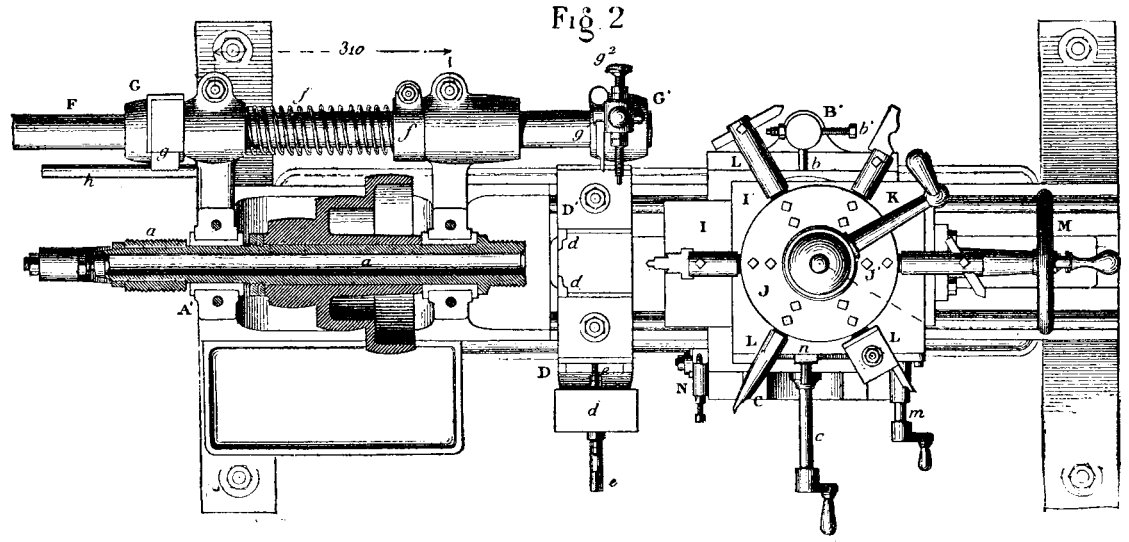
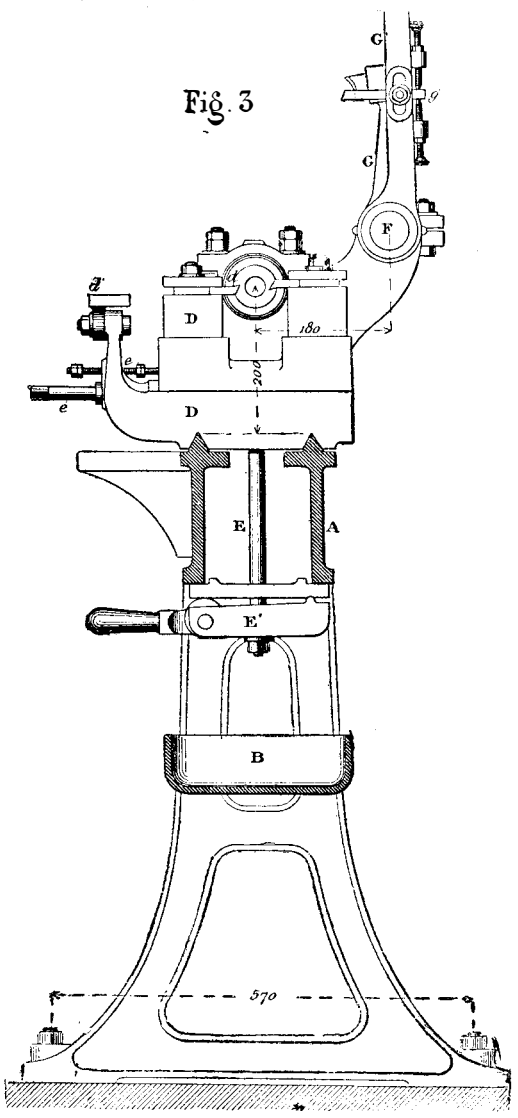



Fig. 3




THE FRENCH FOX LATHE AT THE PARIS EXPOSITION.

As a good example of French practice, I have selected the French Fox lathe, shown in the annexed illustrations, and constructed by M. P. Hure, of Paris. Fig. 1 is a front elevation and Fig. 2 a plan of the machine, Fig. 3 being an end elevation, and it will be seen that in place of the slide rest usually employed in the United States, on the arm of the screw-cutting shaft, a fixed tool, $g'$, with adjusting screws, is employed, and a stop screw, $g^2$, which, when the arm, G', is down, abuts on the face of $d'$, as shown in Fig. 4, the cut being put on by the screw, $g^2$, which screws through the arm, G'. The check nuts on the stop screw, $g^2$, limit the range of cut of the screw-cutting tool, $g'$. This is a lighter as well as a cheaper arrangement than the slide rest usual in American practice, but I doubt if it is quite as handy. Upon D is mounted a duplex slide rest, D', the back tool, $d$, being upside down. The two tools, $d$ $d$, are best seen in the plan, Fig. 2, the handle for this slide rest being at $e$, and the stop screw at $e'$, which is more clearly seen in Fig. 4. Duplex rests with one tool upside down have not found much favor in the United States, but there are quite a number of them at the shops of R. Hoe & Co., New York City. The device, E',

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Figs 1 and 2, for locking this slide rest to the lathe shears, will be recognized as American, but I do not think that Fox (the American inventor of this class of lathe) was the inventor of it. The spring, *f'*, steadies the shaft, F, the die, *g*, when in gear fitting direct upon the hob, *a*. I mention this because there are some of this class of lathes exhibited in which gearing is used to cause the hob, *a*, to revolve only half as fast as the live spindle. Hence the pitch of the hob thread is not the same as the thread to be cut. Coming now to the revolving head, which is seen in Figs. 1 and 2 in position upon the lathe, the lower slide, C, has a stop at N, and the slide, *r*, a stop bar, *m*. At C' is the handle for a worm operating in a worm wheel within *r*, the latter revolving the head, J, the internal construction of the head being shown in Figs. 5, 6, and 7. A number of tools are shown in the turret head, but I have noticed that throughout the exhibition no box tools are shown, except in Warner & Swazey's exhibit in the United States section.

A feature of this machine to which attention must now be called is that, after each tool is brought into position to operate upon the work, the turret, J, is locked to the base, *r*, in order to make it rigid, the construction being as follows: The bolt, *j*, Fig. 6, is slotted at its upper end to receive an eccentric or cam on the shaft, K, while its head is in a recess in the piece, I'; hence, by revolving the shaft, K, by means of its handle, this bolt grips and locks (or releases, according to the direction of the motion of the handle on K) I' and J together. Of course, a cam motion of this kind acts very quickly, and is sufficiently firm for the purpose. In other forms of this head, however, a stepped washer, acting as a cam, is used, the construction answering exactly to that patented by Samuel Putnam, of Fitchburg, Mass., and used on the tail stocks of his patent lathes. In yet another form a plain bolt and a nut handle are used on a square top slide rest, the construction being shown in Fig. 8, where four tools are shown in position in the slide rest. This arrangement is patented in the United States by Professor King, of the Wisconsin University, at Madison, Wis. As tending to show that this class of machine has been in European practice copied from American designs, modifications in detail merely having been made, we have the fact that the slideways of the shears are raised vees; whereas, in the European forms of shears for all other lathes, flat shears are employed. The shears, however, are, up to the present, made in one piece here, whereas in the most recent American practice that part that carries the turret head is bolted to that which carries the lathe head, so that it can be raised to take up the wear of the vee slide. This feature will doubtless find its way here in due time. A well-known American engineer, who now has a factory in England, is, I am told, making a lathe that is a compromise between the American and English forms. He uses the English flat shears, but the American apron and slide rest; thus by the latter means avoiding the defects of the English lathes pointed out in my letter upon that subject. It is due to him, however, to say that his designs were complete before the article was written. JOSHUA ROSE.

Fig. 4

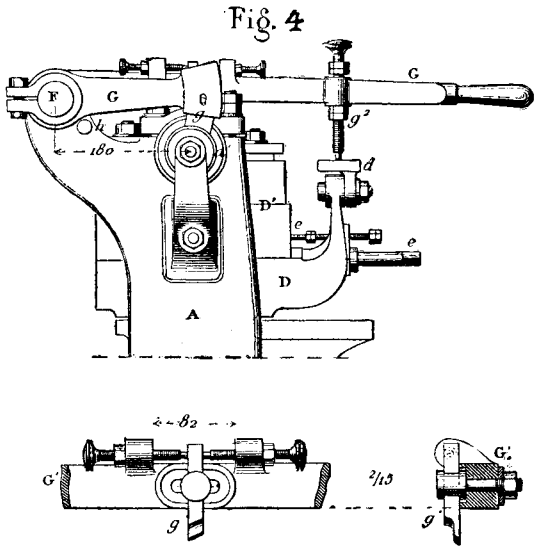



Fig. 5

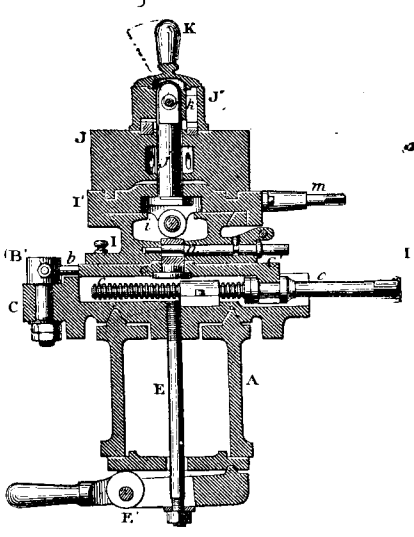



Fig. 6

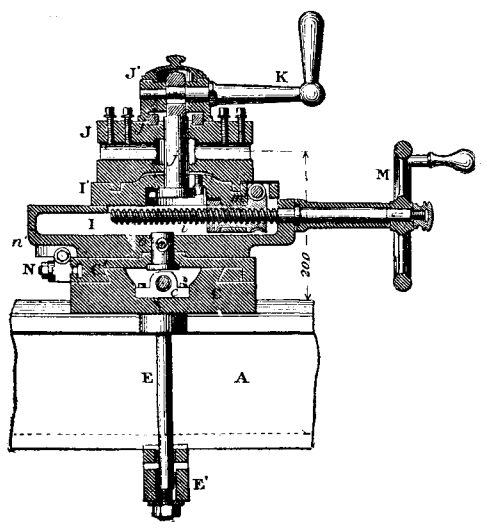



Fig. 7

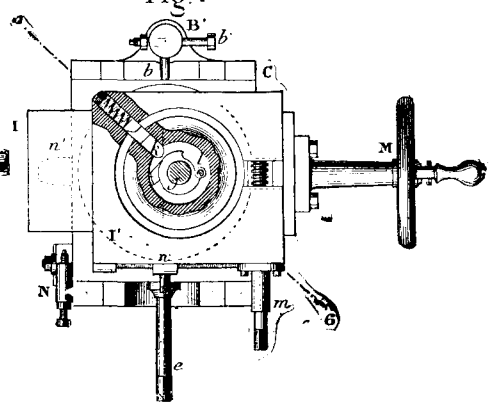
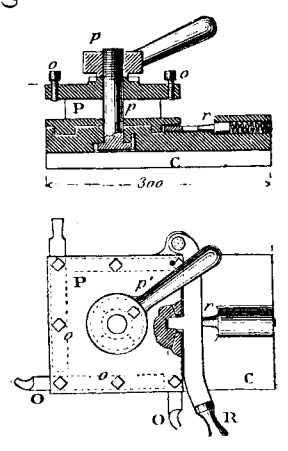



Fig. 8




THE FRENCH FOX LATHE AT THE PARIS EXPOSITION.

### Great Steel Works near Baltimore.

The Pennsylvania Steel Company has been making rapid progress in the building of its iron and steel plant at Steelton, a few miles below Baltimore, Md. The blast furnace plant consists of four furnaces, each 85 by 22 feet, with a complete plant of Whitwell hot blast stoves. The furnaces are now all completed, and when blown in will run on foreign ore, making Bessemer pig iron. The company will also erect mills for making Bessemer steel rails. It is also its intention to have a shipbuilding plant in connection with these works. This department of the works will not, however, be developed until the new foundries and mills are all completed. The additional foundries, sheet mills, rolling mills, cupola houses, etc., will, when completed, be capable of producing everything in the way of steel articles that may be needed in the manufacture of steam engines, steamships, steel bridges, steel rails, etc. The cupola house is to be 169 feet 6 inches long by 87 feet wide, and was begun a few days ago. There is a small army of men at work. The converter house will be 120 feet long by 140 feet wide and 50 feet high, divided into three floors, and will have four cupolas for melting iron and two 15 ton Bessemer converters for converting the iron pigs into steel ingots. Next to the latter building there will be built a blooming mill and rail mill. It will be about 80 feet wide and 850 feet long. The minimum production of this mill will be 1,000 tons of steel rails per day. There is also being dug by the company, from its property front to the Craighill channel, a channel 6,000 feet long, 200 feet wide, and 27 feet deep, one-half of which is already finished and in use by the ships now bringing iron ore from Cuba.

### An Improved Way of Using the Hypodermic Method.

Dr. P. G. Udell, of Spencerport, N. Y., writes: "Every physician who employs the hypodermic method is aware of the fact that painful swelling and abscess not infrequently follow its use. This undoubtedly arises from the introduction of septic matter—because the method of antisepsis has not been rigidly applied to this simple surgical proceeding. The sources of infection are numerous. The syringe may be unclean; the needle may be foul; the hypodermic tablet may be composed of materials that undergo fermentation; the water used as a solvent may be impure; the spoon employed to prepare the solution in may furnish the septic matter, etc. I have for some time used a method whereby the above dangers may be positively avoided. In one of the compartments of my syringe case I carry two small test tubes, nested; the inner one is converted into a vial by closing the open end with a cork, and contains my hypodermic needles immersed in absolute alcohol. This agent sterilizes any septic matter that may be on the needles, and does away with the necessity of using a wire for maintaining the potency of the same; there is no rusting, and the needle is always aseptic. I frequently cleanse the syringe with a 5 per cent carbolic acid solution. Having occasion to use it, I free the needle of alcohol by passing through it water that has been boiled. I now dissolve one of Wyeth's tablets in a few minims of boiled water, and for this purpose carry the second test tube, in which water may be boiled quickly over any flame that may be convenient, a match answering the purpose very well. After the solution is sufficiently cooled, it is drawn into the syringe, and is ready for use. The above plan may seem somewhat fussy in detail, but in practice is exceedingly simple, and, if followed as directed, should relieve the physician of those mishaps so annoying to himself and patient. If some instrument maker will materialize this idea, it will involve but slight increase in size of the pocket case now in use."—*Medical Record.*

### The Miasmatic Theory of Acute Rheumatism.

To most practitioners acute rheumatism must appear essentially a personal or constitutional ailment occurring most readily under certain unfavorable conditions, such as fatigue, exposure, depression, with wet or cold weather. There is a disposition, however, among some physicians to regard it as dependent essentially on miasmatic conditions.

One of the latest expositions of this view is to be found in a paper read before the German Medical Society of New York by Dr. Leonard Weber, and contained in the New York *Medical Record* of August 31. Dr. Weber considers it nearly proved by the labors of Immermann, Edlefsen, Friedlander, and their pupils, that what he calls inflammatory rheumatism, and what is generally termed acute rheumatism, is not produced by taking cold, *i. e.*, refrigeration of the heated surface of the body, but that it belongs to the class of miasmatic infectious diseases assuming an epidemic-like character at certain times, in so far as we are apt to see a larger number of cases when there is decreasing rain and moisture, while with an increase of the same the number of cases is diminished. Among other points he considers as nearly proved that rheumatism is also a house disease, the subsoil of houses in certain locations being infiltrated with the virus, which, after prolonged dryness, may be set free by the air currents carried into the apartments.

In masked forms of rheumatism there may be an absence of one or other of the main symptoms and of the polyarthritis. Neuralgia of the trigeminal, sciatic, spinal accessory, or other nerves, with slight febrile movement, may be of a rheumatic nature, and yield to alkaline and salicylate treatment after other remedies have failed. Dr. Weber says that his records show that the greater number of his cases of polyarthritis rheumatica occurred in February and March, and again in the hot and dry summer months. We do not commit ourselves to the theory of the miasmatic or external origin of acute rheumatism.

By the way, Dr. Weber does scant justice to our own countryman, Dr. Maclagan, who must be chiefly credited with this theory, which, indeed, led him to the use of salicin. We incline strongly to the personal and constitutional theory of its origin. But it is well to keep all well-argued theories in view. It is satisfactory to note that Dr. Weber regards the salicylate of soda, which he gives generally with the bicarbonate, as standing in the foremost rank of valuable drugs with which modern chemistry has presented us.—*Lancet.*

### Heinrich's Chronometer Improvements.

Among the awards at the Paris exhibition was that of the grand silver medal to Mr. Hein H. Heinrich, of New York, for his remarkable chronometer inventions, namely:

1. A simplified application of weight for compensation in ordinary temperature from 40 to 95 degrees Fah.

2. An auxiliary balance for compensation in extremes of temperature; self-adjusting compensation.

3. A new system for regulating the isochronism and for regulation in positions.

These devices permit the regulation of timepieces with far greater accuracy than heretofore.

AN interesting electrical machine can be seen in operation on the framework of the new war ship Maine, in the Brooklyn navy yard. It is a drill. Instead of the slow and tedious pawl and ratchet hand drill commonly used, is one that is set a-whirling by an electrical current sent through carefully insulated wires. A three-quarter inch hole in a three-quarter inch plate can be drilled in less than a minute. The chief objection is that the propelling current is deadly.

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### Soapstone.

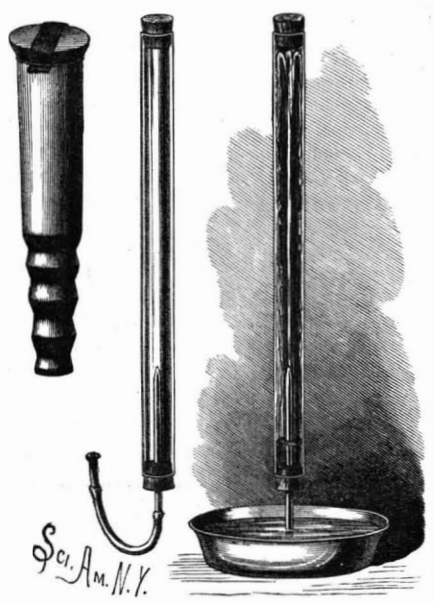
On the summit of one of the prettiest groups of hills that lie north of the divide between the Fourche and Hurricane creeks, in Saline County, Arkansas, at an elevation of five hundred feet above Little Rock, are situated the soapstone quarries. The soapstone and serpentine are principally embraced in three hills, each about one hundred feet high, over two hundred feet wide, and three-quarters of a mile in length. Soapstone being one of the primary rocks, the depth of these deposits is unknown, but believed to be inexhaustible, some quarries being now worked to depth of 300 feet. This property has been prospected sufficiently to show the great value and immensity of these deposits.

Prof. C. D. Smith, geologist for North Carolina, in his report on the property, says: "The soapstone and serpentine and slates are, if I may so express it, grouped together in one locality, so that one mining camp will be sufficient for them all, and one terminus or station will serve them all alike. It is unusual to find such a grouping of valuable materials so essential in our progressive civilization."

So much soapstone is used in manufacturing establishments for various purposes, that the supply is not equal to the demand. Soapstone will not corrode, but remains always pure. It is composed of 62 per cent silica and 34 of magnesia, two of the most durable substances known when exposed to the atmosphere or fire. It is practically without expansion, and a better radiator than any metal. Soapstone, as a finish or covering for walls or ceilings, is coming into use. It takes a high polish, is pearl gray in tint, is said to possess the best possible surface for painting, either in oil or water colors, and, what is very desirable, will neither crack nor chip. It is claimed for it that it is a non-conductor and non-absorbent; that it can be washed without injury; nails can be driven into it without damage; when subjected to heat, moisture, and chemical fumes, it gives no smell and does not turn yellow with age, thus being especially adapted to churches, schools, hospitals, and hotels. Soapstone is just now being given special attention as a pigment for protecting steel vessels against corrosion. Its latest application, however, is that for a paint for protecting the insides of iron and steel ships and other structures, which difficult problem this valuable material has been the means of solving. Soapstone is also used for preserving structures built of limestone and other stones liable to disintegrate under atmospheric influences. Soapstone as a paint, being transparent when ground by itself, shows only the added color, thus forming a foundation on native woods before varnishing, as also a coating on polished steel and iron to preserve them from corrosion. It is suitable for all inside and outside work, and wherever materials are exposed to the variable changes of the weather, owing to its waterproof merits, as also being a fireproof paint. This soapstone, in foundry facings, is far superior to the present commercial soapstone facings manufactured in Eastern cities. As this soapstone is free from grit, it is especially desirable for hollow wares or other light castings requiring a superior finish, as it leaves the castings very smooth and of a bright appearance, as the metal will not run or burn at the time of pouring. Soapstone manufactured into steatite grease or oil is a perfect lubricant, having a good body and entire freedom from any impurity, and is not affected by acids, steam, heat or cold, and is invaluable when there are "hot boxes." Soapstone is used in polishing marble and glass for mirrors. Soapstone is especially adapted for a make-weight in soap and paper factories, and where adulteration is used, as it is not poisonous. Soapstone as a base for cosmetics in some points excels the best imported French talc, which commands a high figure. Soapstone for the manufacture of porcelain, Parian, China, Bohemian and other wares is claimed to be the best and cheapest material in the United States for such purposes. In China it is used to form the household gods, hence it has been called the figure stone. When carefully manipulated, it will make the handsomest articles by whatever name known, and will take the richest colors, either blue, crimson, or gold, and when retaining its own color a pure, transparent white. Soapstone slabs are extensively used for manufacturing into laundry, bath and acid tubs, and in chemical laboratories, as also in the manufacture of different varieties of stoves, mantels, linings, heaters, caskets, assay furnaces, gas burners, and wherever acids are used or there is a necessity to retain heat, or where a fireproof article is necessary. Soapstone, as a material for firebricks—handsome, knife-edged, making close joints, free from expansion or contraction, and preserving the integrity of the furnace walls—has no superior in the market. This soapstone is especially adapted for furnace linings where ores are reduced by fluxes and as a material for crucibles. In the manufacture of pressed bricks for buildings, this material has no equal, for it leaves a smooth, polished face, sharp edges, and can be manufactured in all colors from a cream to black, making a valuable brick for its lasting properties as well as for its highly ornamental finish. Manufactured into enameled brick it is a success; having the suction necessary to retain the enamel, it is equal to any material known, requiring but little enamel to cover surfaces. Pressed, moulded and cast into any form, as terra cotta or other architectural work, there are but few materials which can be worked to such advantage and with such profits. Thus, this soapstone—remaining perfectly white after being worked in the finest wares and exposed to the greatest heat, enduring the highest temperature without fusing, at the same time acquiring a semi-vitreous texture and peculiar translucency and toughness, when enameled retaining a beautiful gloss in its own colors, giving a handsome finish to every article it is moulded into, remaining strong, lasting, and free from checks—needs only skilled labor and machinery to establish a vast industry giving employment to thousands.—*Arkansas Soapstone Manufacturing Co., Little Rock, Ark.*

### MOUTH VACUUM APPARATUS.*

It is quite practicable to perform many vacuum experiments by using the mouth as an air pump, thus dispensing almost entirely with mechanism. The operation of producing a partial vacuum is facilitated by employing a valve, such as is shown in the left hand figure of the engraving. This valve consists of a thick tube of hard wood, having a bore of about 1-16 inch. One end of the tube is corrugated to receive a rubber pipe, and over the other end is tied a valve of elastic rubber. By connecting this valve with a stopped glass tube by means of a flexible rubber pipe and a




MOUTH VACUUM APPARATUS.

jet tube in the manner shown, and then sucking the air through the valve, a partial vacuum may be quickly formed in the tube. The vacuum will be retained by the valve, so that when the valve is disconnected from the jet tube, while the latter is immersed in water, the pressure of the external air will cause the water to enter the glass tube through the jet in the form of a fountain.

Using an ordinary kerosene lamp chimney as a receiver, many of the familiar vacuum experiments may be successfully carried out. Among these are the hand glass; the inward deflection of a rubber membrane tied over the mouth of the chimney; the crushing force of the atmosphere exhibited by the rupture of a thin piece of bladder or tracing paper, arranged as in the last experiment, and the dilatation of a balloon partly filled with air and placed within the chimney. The raising of a mercury column by atmospheric pressure; the exhaustion of Magdeburg hemispheres are experiments practicable with this apparatus.

* From "Experimental Science," by George M. Hopkins. Munn & Co. publishers, New York.

### How they Unload and Load Ships at Buffalo.

The steel steamship America arrived at this port at 3:15 o'clock in the morning with a cargo of 104,000 bushels of corn. At 9:15 o'clock at night, 18 hours after her arrival, she was ready to sail, having on board 2,700 tons of coal, besides her fuel. She was unloaded, too, at what has been considered a slow elevator, and her coal cargo was not loaded in unusually fast time. She saved her fuel time, about six hours, by getting the soft coal from a barge while discharging her corn.

Considering the great size of both cargoes, the America's is the best dispatch on record at this fast-work port. Nearly 6,000 tons of corn and coal were handled in but little longer time than from daylight to dark. There is not another port in the world than can duplicate this feat. And yet, had the America been sent to a house with two elevating legs—and Buffalo has half a dozen such—the entire work could have been done in six hours less.

The America was built here, and is owned by a syndicate of Buffalo men, who have in contemplation the construction of a duplicate. She is the largest carrier on the lakes for her dimensions.—*Buffalo Courier.*

### Wages on the New York Elevated Roads.

The following list of the rates of pay is said to be in operation on the Manhattan (elevated) road in New York City:

RATES OF PAY.

(All employes are paid by the hour.)

| | Cents. |
|---|---|
| Engineers: | |
| At appointment | 33.3 |
| End of six months | 36.1 |
| One year and after | 38.8 |
| Firemen: | |
| At appointment | 17.7 |
| End of six months | 19.4 |
| One year and after | 22.2 |
| Conductors: | |
| First year | 20.0 |
| Second year | 22.0 |
| Third year | 23.0 |
| Guards: | |
| First year | 15.0 |
| Second year | 16.5 |
| Third year | 17.5 |
| Fourth year and after | 18.5 |
| Platform men: | |
| At employment | 10.4 |
| End of six months | 12.5 |
| One year and after | 13.8 |
| Gatemen: | |
| First year | 10.4 |
| Second year | 12.5 |
| Agents and operators: | |
| At appointment | 14.5 |
| End of six months | 16.7 |
| One year and after | 18.8 |
| Station agents: | |
| First year | 14.5 |
| Second year | 16.7 |

The station agents and operators, the platform men, and the gatemen work twelve hours a day without intermission, though it appears there is a State law prohibiting such a practice without a half hour for a meal.

### Left-Leggedness.

A paper on "Left-leggedness" was read before the British Association by Dr. W. K. Sibley, who said that Professor Ball in "Le Dualisme Cerebral" speaks of man as a right-handed animal. Being right-handed, it is popularly assumed that he is also right-legged, but this does not appear to be the case. Standing working with the right hand, there is a tendency to use the left leg for balance. Many people find less exertion in going round circles to the right than in circles to the left. Race paths are nearly always made for running in circles to the right. So the majority of movements are more readily performed to the right, as dancing, running, etc.

The rule in walking is to keep to the right, and this appears to be almost universal. It is more natural to bear to the right. Of a large number of people from the better educated classes asked about the existence of the rule, only 67 per cent males and 53 per cent females were aware of the rule. The large majority obey it unconsciously in walking. Crowds tend to bear to the right. The left leg being the stronger, it is more readily brought into action. Hence troops start off with the left foot. It is the foot which is placed into the stirrup of the saddle or step of bicycle in mounting. So the left is the foot which a man takes off from in jumping.

In the experiments of Mr. G. H. Darwin, blindfolding boys and telling them to walk straight, the right-handed one diverged to the right, and *vice versa.* From measurements of Dr. Garson of the skeletons of the two legs, in 54·3 per cent the left was the longer, and 35·8 the right. For measurements of the feet, the author collected the drawings and measurements of 200 pairs, with the result that in 44 per cent the left was longer, in 21·5 per cent the right, and in 34·5 per cent they were the same size. Measurement at the first joint gave 56 per cent left larger, and at the instep 42·5 per cent. From the table of the figures it is observed that the left foot is more frequently the larger in the male than female sex, and the percentage of feet of the same size is greater in the female. The percentage of the right larger than the left is very constant, whereas the numbers of the left larger and those in which both feet were the same size are much more variable. Man, being naturally or artificially right-handed and left-legged, tends unconsciously to bear to the right; lower animals, on the other hand, appear nearly always to circle to the left.

### A Visit—the Sherwin-Williams Co. Paint Factories.

We have received a very elegantly printed brochure, in curious and tasteful antique binding, describing the Buffalo factory of the above concern. Printing and illustrations are unexceptional. The text is in dialogue form, the manager of the works being represented as escorting a party through the great factory, and as describing all the features of the manufacture of the highest quality of mixed colors. The subject is treated very graphically, and the book can be read with much interest. It is one of the most characteristic trade circulars that has reached us for some time.

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### Southern Progress.

The *Manufacturers' Record's resume* of new Southern industries for the first nine months of the present year shows a total of 4,053, as compared with 2,942 in 1888, 2,594 in 1887 and 1,175 in 1886, as currently recorded in the columns of that publication. These figures include 825 saw, planing, and shingle mill, sash and door, stave or other wood-working enterprises, as compared with 626 in 1888, 512 in 1887, and 362 in 1886. There are also reported 10 agricultural implement factories, 61 furniture factories, and 42 carriage and wagon factories. Adding these to the mills and other wood-working establishments, a total of 938 new enterprises in nine months is given, as compared with 626 dependent upon mineral resources, including mining and quarrying, iron furnaces, machine shops and foundries, stove foundries, rolling mills, miscellaneous iron works, pipe works, etc. Flour mills, cotton mills, cotton compresses, cotton seed oil and canning factories make up a total of 405. It will thus be seen that from an industrial standpoint forestry products and manufactures therefrom greatly overshadow all other resources in the South in rapidity of development.

## THE HARD-SCALED BASS OF THE PACIFIC.

C. F. HOLDER.

In the National Museum and collection of the Philadelphia Academy of Sciences can be seen specimens of a fish somewhat resembling the black bass, but of gigantic dimensions. It is labeled hard-scaled bass, and is known to science as *Stereolepis gigas*.

In examining this bass some years ago in Philadelphia I determined, if occasion offered, to see it alive; and during the summer of 1889, in several months spent at the island of Santa Catalina, California, I had the desired opportunity, catching a large specimen myself and seeing at least thirty, ranging from seventy-five to three hundred pounds, brought in by others. The accompanying cut, drawn from a photograph taken with the captor holding the line to show the relative size, gives an excellent idea of the fish, though failing to convey the impression of bigness suggested by a view of the fish itself.

The Stereolepis ranges, as far as known, from the Farralones in the Pacific Ocean down the coast at least five hundred miles below San Diego, and probably lower yet. It is one of the most conspicuous of the serranoid fishes of this coast, not only on account of its size, but the numbers which are taken. It is most abundant off the islands, especially at Santa Catalina and San Clemente, yet at these points they seem to vary year after year in numbers. The spawning time I was enabled to fix at from September 1 to 15, with possibly some variation. Of twenty or more that I examined in August and September, all were females and ready to spawn, and were evidently in shore for that purpose; it was upon a special spawning ground, known as Pebble Beach, that nearly all were caught.

This locality is a pebble-covered beach about one-quarter of a mile long, the pebbles reaching well out, giving a good bottom for the eggs when deposited. The shore is protected by two rocky points, and between them or in the immediate vicinity nearly all the Jew fish are taken. Four years ago large numbers were caught here, one man informing me that he had hooked thirty in a forenoon. This meant nine thousand pounds of fish. Immediately after this the fish became scarce, and this same Mexican fisherman told me that it was due to the fact that the fishermen had cut up hundreds of Jew fish and thrown the heads overboard, so frightening others away. This explanation is a characteristic one, but other reasons will be required by Americans.

The fish undoubtedly migrate to a certain extent, and vary in numbers year after year. They retire to deeper waters in winter, perhaps going south, being rarely if ever caught then; but in summer they come in shore, approaching the shoals and rocky islands. At San Clemente they are particularly common, being seen by the vessels at their anchorage, moving about the hooks lowered down for them.

The Stereolepis is, as stated, one of the serranoid fishes, related to the bass, the groupers of the south, and others. In general appearance it resembles a black bass. Of those seen by the writer, the largest was a little over three hundred pounds in weight, and measured about six feet in length. The smallest weighed seventy-five pounds, the average being two hundred pounds. They attain a weight of six or seven hundred pounds, specimens of this size being comparatively rare.

In the Atlantic (south) we have an allied form, the gansa or warsaw (*Promicrops itaira*), that attains a weight of over six hundred pounds. It is known to the fishermen as the Jew fish, which is the common name for the California serranoid.

The economic value of the Jew fish is not inconsiderable. It was for some years caught in large quantities at Santa Catalina and sold as boneless cod, which, I understand, is still kept up. The fish also brings a fair price in the market, somewhat resembling halibut in flavor, though the flesh of large specimens is gross and coarse.

The Jew fish being a deep-water form, ranging in depths from thirty feet down, lines are used in its capture, what is known as a large halibut line being employed, with a small-sized shark hook, and a sinker three or four feet above. A live white fish is considered the most successful bait, though I found that half a barracuda (*Sphyraena argentea*) was a good lure. The capture of the fish is exciting, and to show its power,

THE HARD-SCALED BASS OF THE PACIFIC.

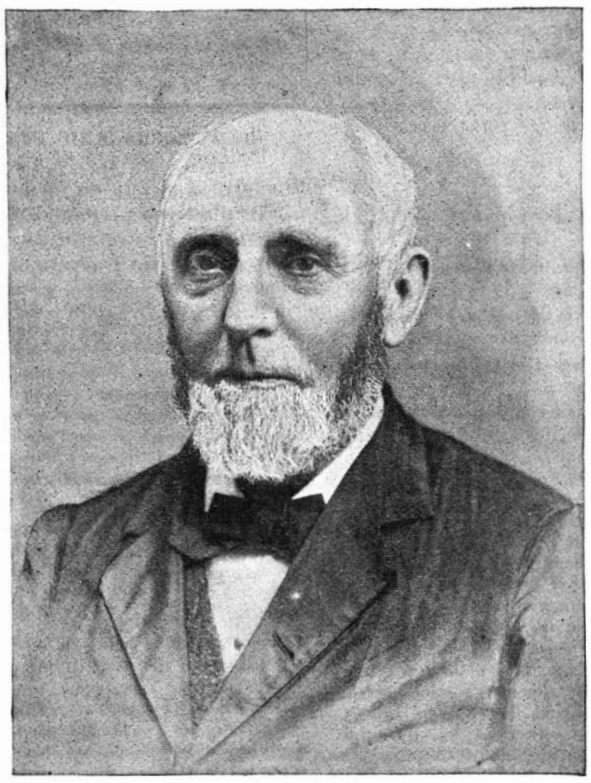
the one hooked by the writer required all the methods of shark fishing, though the runs were by no means as long. This specimen weighed nearly three hundred pounds. In hauling it in it sounded repeatedly, taking the line from me with considerable force. It towed a large boat about for some time, and was taken alongside only after a determined fight by my Mexican boatman, then stunned by repeated blows upon the head with an ax; yet it was alive and vigorous an hour later, when hauled ashore.

## GEORGE HAMMELL COOK.

This distinguished geologist was born in Hanover, Morris County, N. J., on January 5, 1818. He early turned his attention to civil engineering, which practice he followed in connection with the laying out of the Morris and Essex Railroad and the surveying of the ground for the Catskill and Canajoharie Railroad. His experience soon led to a desire for a better education, and in December, 1838, he entered the Rensselaer Polytechnic Institute, in Troy, where he graduated a year later, with the degree of C.E.

For two years he then devoted himself to teaching, but in 1840 he returned to the Institute, where he acted as tutor, and also pursued studies leading to the degrees of B.N.S. and M.S. He was made adjunct professor there, and in May, 1842, became senior professor, which was equivalent to the office of president elsewhere, teaching geology and civil engineering.

In 1846 he entered commercial pursuits in Albany,



GEORGE HAMMELL COOK.

N. Y., and for two years was engaged in the manufacture of glass. He then became professor of mathematics in the Albany Academy, where he was made principal in 1851.

Professor Cook had, meanwhile, become favorably known as an educator, and in 1853 he was called to the chair of natural sciences at Rutgers College, in New Brunswick, N. J. This chair became that of chemistry, natural history, and agriculture in 1867, and in 1878 was called that of analytical chemistry, geology, and agriculture. In 1880 the department of chemistry was transferred to Professor Peter T. Austen, but until his death Professor Cook remained in charge of the subjects of geology and agriculture. Through his influence, in 1864, the New Jersey College for the Promotion of Agriculture and Mechanic Arts was located at New Brunswick as a department of Rutgers College, and, still retaining his professorship, he became vice-president of the combined institutions.

Professor Cook is, however, best known from his connection with the geological survey of New Jersey. In 1854 he was appointed assistant geologist, and during the years 1855–57 contributed three annual reports on the work conducted under his direction, and a special report of the "Geology of the County of Cape May" (Trenton, 1857). Subsequently the office of State Geologist was allowed to lapse for several years, but in 1864 he presented a report on the "Geological Survey of New Jersey," before the two houses of the State legislature, which resulted in the passage of a law reorganizing the survey and the appointment of himself as State Geologist. Thereafter he published "Annual Reports of the State Geologist of New Jersey." In addition to these he issued, in 1868, a royal octavo volume of 900 pages on the "Geology of New Jersey," accompanied by an "Atlas" of eight maps. The maps relating to geological formations, watersheds, mineral deposits, etc., constructed under his surpervision are regarded by competent judges as the best of those published by the different States of the Union. He also deserves great credit for the "Report on the Clay Deposits of New Jersey" (Trenton, 1878), which treats very exhaustively of the applications of the different clays to their uses for fire brick, pottery, and similar applications. Likewise of great value is the "Catalogue of the Flora of New Jersey" (New Brunswick, 1881), compiled under his direction by Dr. Nathaniel L. Britton, botanist to the survey. Professor Cook probably did more than any other citizen of New Jersey toward the development of the natural resources of his State by his efforts in pointing out to the people the best methods of applying science for the increase of their prosperity.

He was active in the formation of the New Jersey Board of Agriculture, holding the office of secretary from its inception, in 1873, until other duties compelled his resignation from that place in 1879. Meanwhile, however, he had charge of the annual volumes issued during that period, and continued a member of the executive committee until his death.

In 1886 he organized the New Jersey State Weather Service, of which he became chief director, and he was an active member of the board of water commissioners of New Brunswick for over fifteen years, during part of which time he served as its president. He was also for a time a member of the State Board of Health.

Professor Cook was sent to Europe, in 1852, by the State of New York, in order to study the salt deposits there, so that the information that he might acquire could be used in developing the Onondaga salt deposits. Again, in 1870, he visited Europe, and, in 1878, he went to Paris as a delegate to the International Geological Congress held that year in connection with the world's fair.

The honorary degree of Ph.D. was given him by the University of the City of New York, and in 1866 Union College conferred on him the degree of LL.D. Professor Cook was a member of the Royal Agricultural Society of Sweden, and in the United States he was member of the American Association for the Advancement of Science, which he joined in 1850, became a fellow in 1875, and was elected vice-president of the section on geology and geography in 1887. At the Cleveland meeting, in 1888, he delivered his address, choosing as the subject "The International Congress, and our Part in it as American Geologists."

He was also a member of the American Philosophical Society (1864), of the Academy of Natural Sciences of Philadelphia (1869), and of the American Institute of Mining Engineers (1874), also, in 1887, he was chosen to the National Academy of Sciences.

Professor Cook was taken ill at his laboratory on Saturday, the 21st ult., and his condition was not at first regarded as serious; but his failing strength, combined with his advanced years, prevented his rallying from the attack, and he died suddenly, of heart failure, in the afternoon of September 22, 1889. M. B.

### Consumption of Timber in Mines.

It would be interesting to know how much timber is used yearly in the mining industry. In the Anaconda mine alone, near Butte City, Mont., 80,000 feet of timber are put under the ground daily, or at the rate of 30,000,000 a year. At the smelting works at Anaconda, belonging to the same company, there are 180 cords of wood used daily, or 65,700 cords a year. For wood, a 40,000 cord contract is the smallest that will be let, and contracts range in size up to 200,000 cords. Nearly 1,000,000 cords of wood are kept on hand. All the timber used for mining purposes can be legally cut from government land, a privilege that mining companies, it is hardly necessary to say, avail themselves of when possible.

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## RECENTLY PATENTED INVENTIONS.

### Engineering.

CONDENSER.—Charles King, New York, N. Y. The object of this invention is to procure fresh from salt water for use in boilers. The salt water is introduced into a chamber under vacuum, where it is boiled, and the steam conducted away through a pipe to the water receptacle.

### Railway Appliances.

SNOW PLOW. — Paul Graeb, Berlin, Germany. Two pairs of helical blades are mounted on shafts in front of a carriage, one in advance of the other. Rotary motion is imparted to these shafts from the front wheels of the locomotive. The snow, as it is cut by the blades, is thrown to the sides of the track.

CAR BRAKE. — Fred Miller, of Johnstown, and George Gregory, of Braddock, Pa. A cylinder is mounted under the car, into which is passed some fluid under pressure, and under the control of the engineer. By increasing or decreasing the pressure in the cylinder, the piston is forced out or in and the brake mechanism set or released.

CAR COUPLING.—Frank Pardee, Hazleton, Pa. Two jaws are pivoted in the link opening of the drawhead, and they are so arranged as to fall and engage the link as it passes into the drawhead. The link is released by separating the jaws, which may be done from the top or at the side of the car.

CAR COUPLING.—Simon J. Freeman, Bradford, Pa. This coupling consists of a hook that is mounted horizontally, but has a vertical movement for uncoupling. A spring-actuated lever is mounted at the side of the drawbar, and bears against the corresponding hook of the other car during coupling, and forces the hooks into engagement.

### Mechanical.

AUTOMATIC VENDING MACHINE. — Fred. B. Cochran, New York, N. Y. This is a new design of machine in which, when a coin is placed in the slot, the clock mechanism is set in motion, the goods delivery mechanism is tripped, and the article delivered into the chute, whence it is removed by the purchaser. If a coin of light weight be used, the mechanism will not trip, and the article will not be delivered.

WARP PLAITING MACHINE.—Clayton Denn, Philadelphia, Pa. In this machine the warp is passed through a tube which receives alternately a vibrating motion in two directions at right angles to each other, mechanism being provided by means of which an alternately slow and fast swinging motion will be imparted to said tube.

### Agricultural.

BRAKE FOR THRASHING MACHINES.—John W. Lefevre and Lorenzo D. Young, Jr., Toledo, Iowa. This is designed to be operated from the top of the machine, and is so constructed that the brake may serve to lock the wheels when the thrashing machine is in operation.

CATTLE TAG. — Daniel H. Talbot, Sioux City, Iowa. This tag is composed of two parts to be united by a connecting shank on opposite sides of the ear of the animal to be marked. The name of the owner may be printed on the face of one of the button sections.

CORN CUTTER. — Mr. Harry Willits, New Boston, Ill. A machine for cutting corn on the ear. A wheel, which is rotated by means of a treadle or otherwise, is provided with segmental cutters having oppositely inclined cutting edges. The corn is fed between these knives through a chute.

### Miscellaneous.

CARRIAGE AXLE. — Joseph Blair, St. Charles, Quebec, Canada. This is an axle of novel construction provided with an oil reservoir by means of which the axle spindle may be lubricated without removing the carriage wheel.

CLASP. — Francois Lamboley, New York, N. Y. A clasp for cloaks, robes, gloves, etc., which consists of a main plate secured to the garment, and an outer plate hinged by a spiral spring to the main plate and having a catch which engages with a stud on the latter.

ORNAMENTAL WOODEN PANEL. — Wm. Schumacher, Brooklyn, N. Y. This consists of a wooden strip or panel which has been ornamented with paper designs and then stamped in a die, the paper being thereby pressed into the surface and the edges below the surface of the wood.

BASE BALL SHOE. — William Croner, Brooklyn, N. Y. Metallic plates are inserted between the insole and sole of the shoe, so that the spike plate when attached to them will do no injury to the ball of the foot.

BOLT.—John H. Slater, Stanton, Neb. This is a door bolt mounted to slide in a casing secured to the door, and is provided with a bail hinged on the bolt casing, and serving to lock the bolt in place.

NECKTIE BOX. — Joseph Cohn, New York, N. Y. This is a box designed to hold several neckties in a frame, and provided with a tray also designed to hold neckties, this being connected to the main part by a link pivoted at the side of the same, so that the tray may be closed into the box or raised above it vertically for exhibiting the contents.

COOKING VESSEL.—Henry Bodenstein, Staatsburg, N. Y. This utensil is so constructed as to prevent the odors of cooking from passing into the room. Around the top of the vessel is arranged an annular flange into which fits the cover, and when filled with water, the vessel at this point is sealed. A pipe connects the interior of the vessel with the fire chamber for the passage of fumes or vapor.

STOVE.—Daniel Hubbard, Oswego, N. Y. This stove is so constructed that the products of combustion are conducted through the fire pipe into a chamber that serves as a jacket to the stove and renders the radiation intense, while the cold air entering the stove is heated before it reaches the combustion chamber, thus causing the escaping carbonic acid gases to be consumed.

PRESERVE CAN. — Adolf Otto, Neubukow, Germany. This is a can for preserving fruit or vegetables, in which the cover section is provided with vent valve for the escape of gas or steam, and which when closed hermetically seals the vessel.

BOX COVER. — Simon B. Simon, New York, N. Y. A sliding lid having a rib on its under side, which fits into a recess in the wall of the box, so that when the same is rotated, the rib will bear against the wall of the recess and will turn the lid on its pivot.

SHOW CASE. — William C. Rood, Quincy, Ill. This show case consists of a main frame having a sloping glass front, a pivoted inlet frame which holds the goods or articles, and which may be swung out when the latter are to be removed.

## SCIENTIFIC AMERICAN BUILDING EDITION.

**OCTOBER NUMBER.—(No. 48.)**

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1. Elegant plate in colors of a residence at Montclair, N. J. Perspective elevation, floor plans, sheet of details, etc. Messrs. Munn & Co. architects, New York.
2. Plate in colors showing a two story and attic frame dwelling at Montclair, New Jersey, at a cost of five thousand dollars. Mesers. Munn & Co. architects, New York. Perspective, floor plans, sheet of details, etc.
3. Design for a memorial monument at the Langside battlefield. A. Skerring, I.A., architect.
4. Engraving of the Winn memorial public library, Woburn, Mass. H. H. Richardson, architect.
5. A cottage at Mt. Vernon, N. Y., costing four thousand five hundred dollars. Perspective view and floor plans.
6. Residence erected at Mt. Vernon, N. Y., by the Hon. Chas. Crary, at a cost of eight thousand dollars. Plans and perspective elevation.
7. Design for a three thousand dollar railway station. Drawn by Mr. W. Henderson, of the Chicago Architectural Sketch Club.
8. A residence at Bridgeport, Conn., built for I. W. Birdsey, Esq., at a cost of eleven thousand seven hundred dollars. J. W. Northrup, architect.
9. A residence at Chester Hill, Mt. Vernon, N. Y., recently erected for I. J. Smith, Esq., at a cost of twelve thousand dollars. Floor plans and perspective elevation.
10. A stone house on Jersey City Heights, N. J., built in 1812, and recently remodeled by L. H. Broome, Esq. Perspective elevation and plans.
11. A block of brick fronts at Bridgeport, Conn., W. H. Worsam, architect. Cost three thousand six hundred dollars each. Floor plans and perspective elevations.
12. New court house and post office, New Bedford, Mass. Perspective and plans.
13. The Mexican pavilion at the Paris exposition—half page engraving.
14. A residence on Jersey City Heights, N. J., built for G. W. Patten, Esq. Plans and perspective.
15. A colonial house at Englewood, N. J. Edward H. Kendall, architect, New York. Perspective and floor plans.
16. Sketch of Florence Nightingale's home at Lea Hurst.
17. House on Grayswood Hill, Haslemere. Perspective and plans.
18. Sketch of the Fitzwilliam museum, Cambridge. Half page engraving.
19. Entrance doorway to the ceramic and mosaic section, Paris exposition.
20. Bedroom of the Shah of Persia, in the Hotel de la Rue Copernic, Paris.
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## NEW BOOKS AND PUBLICATIONS.

THE WHEREWITHAL SYSTEM. The Wherewithal Publishing Company, Philadelphia, Pa. Price $1.

This is a move in the direction of systematizing methods of thought. It consists of a tablet with seven questions, arranged in order, designed to be applicable to the consideration of all topics. Any given subject is assigned as an exercise, and then these seven questions relative to it have to be answered. In this way a composition or little treatise is formulated and written out by the scholar. There is really a great deal in the method. Its best proof is to apply it to some subject, when it will be found surprising how it draws out one's ideas. It appears a useful adjunct to education, and might receive extensive application in families as well as in schools.

CONVENIENT HOUSES, WITH FIFTY PLANS FOR THE HOUSEKEEPER. By Louis H. Gibson. New York: Thomas T. Crowell & Co. 1889. Pp. 321. Price $2.50.

Fifty plans for houses, with numerous views of the exteriors, form the basis of the present work. The general subjects appertaining to house building are very excellently treated, largely from the standpoint of the relations between architect and client. This gives it a practical and graphic cast that is very acceptable. It is a book rather for the business man who contemplates building than for the professional architect or builder. Estimates of the cost of the different houses are included. The opening of the preface gives the spirit of the book in stating that it is intended to deal with houses in a housekeeping spirit.

DICTIONARY OF ELECTRICAL WORDS, TERMS, AND PHRASES. By Edwin J. Houston, A.M. The W. J. Johnston Co., Ld., New York. 1889. Pp. iv, 640, 15. Price $2.50.

What has become a real want in electrical science, or rather in its literature, is supplied by this volume, which contains a very numerous collection of definitions, which are amplified to all needful extent, so as to make it a brief treatise on the science, while illustrations are used liberally wherever required to illustrate the subject matter. The words and titles defined are printed in heavy type so as to strike the eye immediately. The book should be in every scientific library.

THE AMERICAN AMATEUR PHOTOGRAPHER. By F. C. Beach and W. H. Burbank, New York, and Brunswick, Maine. The American Photographic Publishing Company, publishers, Brunswick, Maine. Pp. 40. Price $1.50 per year, single copies 15 cents.

This is a new illustrated monthly magazine devoted especially to amateur photography in its many different forms and phases, and being edited by two well known amateurs, and published independent of any trade interest, its success seems well assured. From an inspection of the first four numbers we find an abundance of original material of practical value to the skilled and unskilled photographer, with illustrations of home-made apparatus, and examples of some of the best photographs receiving diplomas at the Philadelphia joint photographic exhibition. All of the latest papers relating to photography read before the prominent photographic associations are printed, while a careful digest of their proceedings is also given. In addition, the special foreign correspondence column, giving the latest photographic intelligence from abroad, is quite a valuable feature. The October number has a full page illustration entitled "The Heart of the Forest," by Dr. Charles L. Mitchell, reproduced from a diploma photograph; an illustrated article on canoe and camera by F. A. Hetherington, of considerable interest to canoeists; and an illustrated sketch of the Chicago Camera Club. There are also practical articles on "Lenses," "Photo-Micrography," "Lantern Slides and Lantern Slide Making," "Eikonogen—a New Developer," and (illustrated) a new "Swing-Back Attachment for Detective Cameras," and special apparatus for "Developing Plates by White Light." Other papers of general interest are: "The Joint Photographic Exhibitions," by Robert S. Redfield, and "Suggestions as to the Use of Certain New Organic Reducing Agents as Developers," by James H. Stebbins, Jr. At the end is a list of photographic patents and of dark rooms at various hotels open to the use of amateurs. Enough has been mentioned to show the varied quality of the contents, which together with the fine typographical appearance of the magazine, will make it of interest to the general reader and specially attractive to the beginner. The reliable formulas given in each number are alone worth the subscription price. A magazine conducted such as this is, by practical men, should and no doubt will receive a generous support from the rapidly increasing army of amateur photographers. The New York office is at 22 Burling Slip, N. Y.

PRACTICAL HYGIENE, HYGIENE AND PUBLIC HEALTH. By Louis C. Parker, M.D. Philadelphia: P. Blakiston, Son & Co. 1889. Pp. xvi, 471. Price $2.50.

The ground covered by this work is very extensive, yet by condensing or rather by accurately classifying the topics treated, a quantity of valuable information is brought together within its covers. Water, disposal of sewage, ventilation, warming and lighting, climate and meteorology, soils and building sites, foods, beverages and condiments, exercise and clothing, contagia and hospitables, with statistics and notes on analysis and bacteriology, are included in its plan, and their recital will give some idea of its scope. Numerous illustrations add to the value of what would in any case be an important work for every one.

A POPULAR TREATISE ON THE WINDS. Comprising the general motions of the atmosphere, monsoons, cyclones, tornadoes, waterspouts, hailstorms, etc. By William Ferrel, M.A., Ph.D. New York: John Wiley & Sons. 1889. Pp. ix, 505. Price $4.

This work treats of its titular subject in considerable detail. It includes the consideration of the constitution and nature of the atmosphere, the motions of bodies relative to the earth's surface, including the effects thereon of centrifugal force and of the deflecting force of the earth's rotation. After speaking of climatic influences and of the general circulation of the atmosphere, the specific kinds of storms are taken up, such as monsoons, tornadoes, cyclones, and thunderstorms. From its length and this abstract of its contents it will be evident that the intention of the author is to treat the subject fully, and by a reference to the book it will be seen that this is well carried out. It is a valuable contribution to meteorological science. A few illustrations are given where required. An appendix is supplied by the author, and a good index closes the work.

A TREATISE ON MASONRY CONSTRUCTION. By Ira C. Baker, C.E. New York: John Wiley & Sons. 1889. Pp. xv, 552. Price $5.

This is an eminently satisfactory treatise on masonry, treating of the materials used, the characteristics and methods of determining the same, the preparation and use of materials, laying of foundations and completing of structures in general, the strength of materials, and the bearing power of piles. Coffer dam work, both freezing and pneumatic processes, are given in considerable detail. The construction of dams, now of especial interest in view of operations proposed to be conducted in the vicinity of this city, is treated in one portion of the work. It is throughout a combination of theory and practice that is very attractive, and it seems to fill a want not heretofore adequately provided for in the ordinary literature of the subject. The author modestly claims that it is an outgrowth of the needs of his own class room, he being professor of civil engineering in the University of Illinois, but it is far more than a text book.

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# Notes & Queries

## HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(1415) N. R. E. asks as to size, amount, etc., of wire for simple induction coil, to be best operated by cell of Grenet battery. A. If your Grenet cell is of about 1 quart capacity, a coil of the following dimensions will answer. Core, a bundle of soft iron wires ¾ inch in diameter and 4 inches long. Primary, two layers of No. 18 magnet wire. Secondary, twelve layers No. 36 wire.

(1416) D. J. B. B. asks: 1. What E.M.F. is required to run simple electric motor described in SUPPLEMENT, No. 641? A. 16 volts. 2. Will the C. & C. battery of two cells run it? A. It may run it, but with little power.

(1417) H. A. L. writes: I intend to make a spark coil for gas lighting; kindly inform me through your valuable paper how this can be done. Will a length of 10 inches do for the coil? What number wire or how much of it will it be necessary to use for winding? Which is best, an iron rod or a bundle of iron wire, and what diameter should the iron have? A. Upon an iron wire core ¾ of an inch in diameter and 10 inches long, wind four or five hundred feet of No. 18 magnet wire. This will form a coil suited to your purpose.

(1418) H. M. K.—In artillery practice there is danger in sponging a hot gun, if the piece is hot enough to make steam rapidly. Also the sudden cooling of the hot iron surface may originate defects in the metal from its too sudden contraction.

(1419) Sister Clotilde asks: 1. Which planet's orbit has the greatest dip? A. Mercury, 7° 0′ 7″·71, of the primary planets. Pallas, 30°, of the minor planets. 2. What twelve stars whose actual distances are known? A. *a* Centauri, 61 Cygni, 21,185 Lalande, *b* Centauri, *m* Cassiopeiæ, 34 Groombridge, 21,258 Lalande, 17,418 Oeltzen, Syrius, *a* Lyra, and many others approximately in years of transmission of light. See Astronomy, by Newcomb and Holden, $2 mailed. 3. What advantage has Wimshurst's electrical machine over Holtz's or Cane's? A. The main advantange of the Wimshurst machine is that it will work on moist days, whereas the other machines will not.

(1420) W. F. E. writes: We have a lot of sal-ammoniac which I think contains about 75 per cent of table salt; will you inform me of a simple test I can make to see if it does? A. Heat to low redness. This will volatilize the sal-ammoniac, which will go off in clouds; the salt will for the most part remain. By doing this with a weighed portion you can weigh the residue and determine closely the percentage of salt.

(1421) T. G. writes: Is there any way of gluing meerschaum together? A. The following receipts are given: *a*. Milk is allowed to stand until the cream has risen. It is then skimmed off thoroughly. The skim milk is allowed to stand until it curdles; it is filtered, and the casein left on the filter is washed with rain water. Finally the casein is tied up in a rag and boiled in water and allowed to dry, being spread upon blotting paper. It is dissolved in water glass solution, which is then thickened by addition of freshly burned magnesia and is used at once. *b*. Use quicklime mixed with white of egg to a thick cream. *c*. Use 5 parts plaster of Paris and 2 parts quicklime well ground together. Rub white of egg on parts to be united, mix the plaster with white of egg, in above proportions, and apply at once.

(1422) J. C. asks (1) if I could get beyond the rarefied air, could I live in the ether? A. No. 2. Which of the below named travels the quickest in a second? Light, heat, lightning, sound. Also name them in their order. A. Light, and so-called radiant heat, both of which are now considered manifestations of the action of ether waves, travel at about 180,000 miles per second; sound travels at about 1,125 feet per second; the speed of lightning is uncertain; it is probably less than that of light.

(1423) C. F. McC. writes: Vegetable parchment is penetrated by water but not by oil. Can you tell me anything that will waterproof it? A. Dry it by heat, and while still warm apply paraffin, melting it with a hot iron. As an aqueous application we would suggest the use of a solution of gelatin or white glue followed by soaking in a solution of tannic acid or bichromate of potash. 2. I have some powdered asbestos, also some powdered soapstone. I have tried to mix them with oil to make a paint, but without much success. Can you give me any directions? I understand that they are used in paint. Would turpentine be better than oil? A. Both should be perfectly dry. Repeated and long-continued grinding is essential for mixing paint. Make of thick consistency for the grinding; afterward it can be thinned by simple mixing process.

(1424) J. H. E.—It is not necessary to serve an apprenticeship in a shop to become a marine engineer, although shop experience is of much help. The apprenticeship should be in the fire and engine room. Start as a fireman, and study the principles from books on marine engineering.

(1425) S. T. C. asks how to fix the colors on tin, such as is used to cover trunks. A. Colored varnishes or japans are used. For trunk work the japans are baked on in an oven. For the poorer or cheaper class of work, air-drying varnishes are used.

(1426) O. D. asks: 1. In preparing stock solutions of pyro and sulphite of soda and sal soda, I think that I allowed a very few crystals of sal soda that were clinging to the graduate to mix with the pyro and sulphite soda, for the last named solution has taken on a light brown color. Will this injure it in any way? A. No. 2. Will a few stray rays of light from the moon injure a dry plate? A. Yes; if kept in the light long enough. 3. Is there any actinic power in moonlight? A. Yes; an hour's exposure with full aperture of the lens will produce a negative. 4. I have one of these old Swiss clocks with a bird that comes out at every hour and cuckoos the hour. The arm of the escapement lever was broken some time ago. Can you tell me where I could obtain another? A. Try Tiffany & Co., Union Square, N. Y.

(1427) C. R. asks: What would be the difference of the surface of a six-foot wheel resting on the rail, over a two-foot wheel? If any, how much? A. As the contact of a circle with a straight line is mathematically infinitely small, whatever the size of circle, the contact of a car wheel upon a rail can only be made a measurable quantity by the compression of the periphery of the wheel or surface of the rail. Exact figures cannot be given, as much will depend on the nature of the metal of rail and wheel.

(1428) W. G. N.—For the horse power of your engine: Multiply the square of the diameter of the cylinder by 0·7854, and this product by the mean pressure on the piston, and the last product by the piston speed in feet per minute, and divide by 33,000. The mean pressure on the piston depends upon the point of cut-off, and may be obtained from engineering books. See Engineer's Handy Book, by Roper, mailed for $3.50.

(1429) B. A. H. — The red color in bricks is due to oxide of iron. It can, in some clays, be removed by treatment with acid. It will probably not pay to make yellow brick from such clay alone. See an excellent work on "Brick, Tiles, and Terra Cotta," which we mail for $5.

(1430) T. J. P. asks about the use of sugar to clean boilers, the amount necessary for a twelve-horse power thrashing engine, that uses water from wells, ponds, and creeks, and how applied or put in the boiler? A. Use a pound of sugar dissolved in water, to which add as much sal soda, pumped into the boiler once a week or fortnight. Blow the boiler out after it has been in one day.

(1431) J. A. M.—The variation in the time of the sun's rising and setting is due to the equation of time caused by the eccentricity of the earth's orbit. The "international date line" is a meridian in mid Pacific Ocean, 180° from Greenwich.

(1432) J. J. E. writes: I have a piece of sheet brass which is polished. How shall I make a transparent lacquer for it? A. Make a thin lacquer by dissolving shellac in 95 per cent alcohol. Let it stand in a bottle a few days to settle, then decant the clear solvent. Heat the plate to the temperature of boiling water and varnish quickly.

(1433) T. H. B. asks (1) for the process of making ice (artificially). A. A number of ways are employed. One depends on the vaporization and recondensation of liquefied ammonia ($NH_3$). By pumping it into receivers, it is brought into the liquid state, and on being released from pressure it volatilizes, and by absorption of heat energy reduces the temperature far below the freezing point. We refer you to our SUPPLEMENT, Nos. 32, 35, 73, 171, 215, 252, 254, 274, 288, 320, 335, and many others for illustrated descriptions of different ice making machines, depending on the expansion of air and other principles for their operation. 2. Strictly speaking, does the boiling point of water depend solely upon atmospheric pressure? A. It depends on many other factors as far as the temperature of starting into ebullition is concerned. The presence of salts, nature of the containing vessel, and intensity of heat applied all affect it. The temperature of steam at atmospheric pressure is the constant used in adjusting or graduating thermometers. 3. If pressure of atmosphere were removed, what result would follow as to water? A. It would evaporate instantly.

(1434) W. W. J. asks: 1. Was there ever an engine or motor built on the principle of decomposing water in the cylinder by electricity, and then exploding the gas thus generated by means of an electric spark? If so, where can I get a description of same? A. A search among patent records would be the first step to take in finding such an invention. The idea seems not very practical. 2. What is the difference, if any, between electricity generated by chemical process and that generated by friction, magnets, and otherwise? A. The difference is in tension or potential; frictional electricity has very high tension compared with that generated by a battery.

(1435) W. L. C. asks: How old was Edison (the inventor) when he obtained his first patent? A. Edison was born February 11, 1847. His first American patent is dated June 1, 1869.

(1436) J. N. H. asks: How far should grate bars be set from a 48 in. tubular boiler to give best results in burning sawdust? A. 30 inches. See methods of setting boilers for different kinds of fuel in SCIENTIFIC AMERICAN SUPPLEMENT, No. 624.

(1437) G. B. M. writes: My work is electrotyping. We throw in our sweepings to the electro kettle, and after "burning off" we find lumps of such as is the specimen inclosed floating in the electro metal. A. The lumps are antimony, and are sometimes found after melting old metal; they may be disposed of by adding lead and tin.

(1438) W. N. B. — The forked rod, called "divining rod," held in a person's hands, is in so delicate a state of equilibrium as to be influenced by almost imperceptible muscular movements. The presence or absence of water has nothing to do with its action, except as it affects the imagination of the operator.


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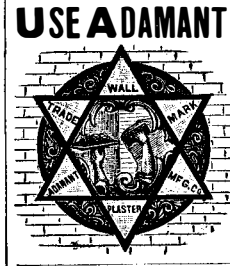


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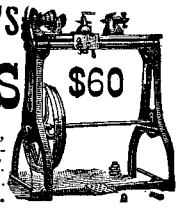


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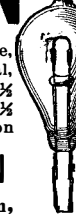

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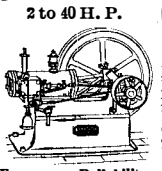

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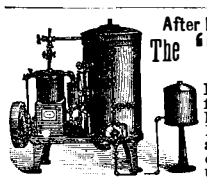

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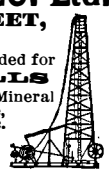

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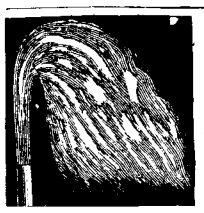

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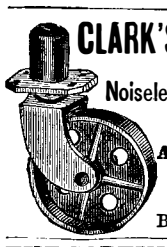

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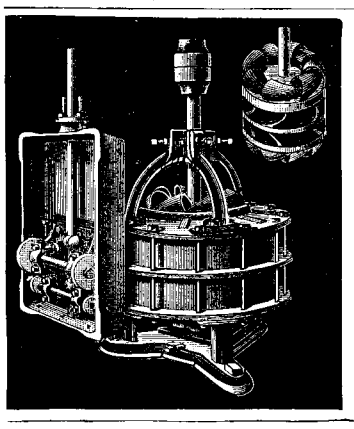

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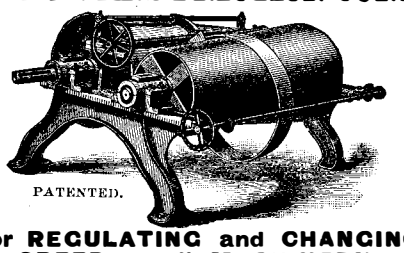

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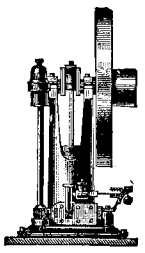

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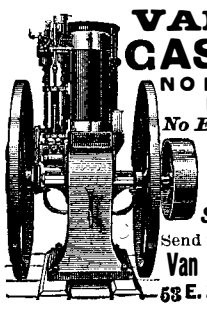

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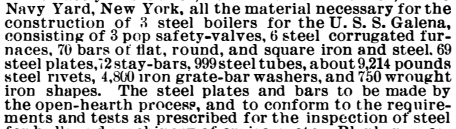


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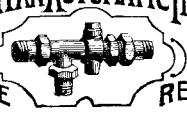

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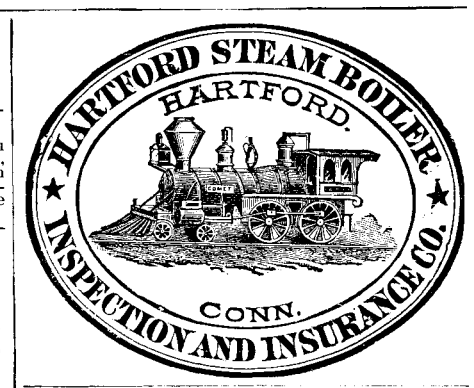


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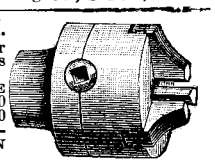

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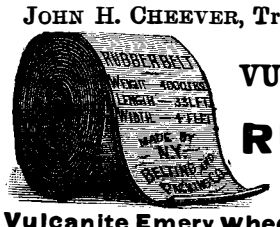


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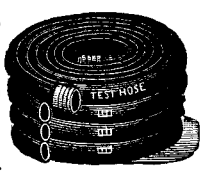


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